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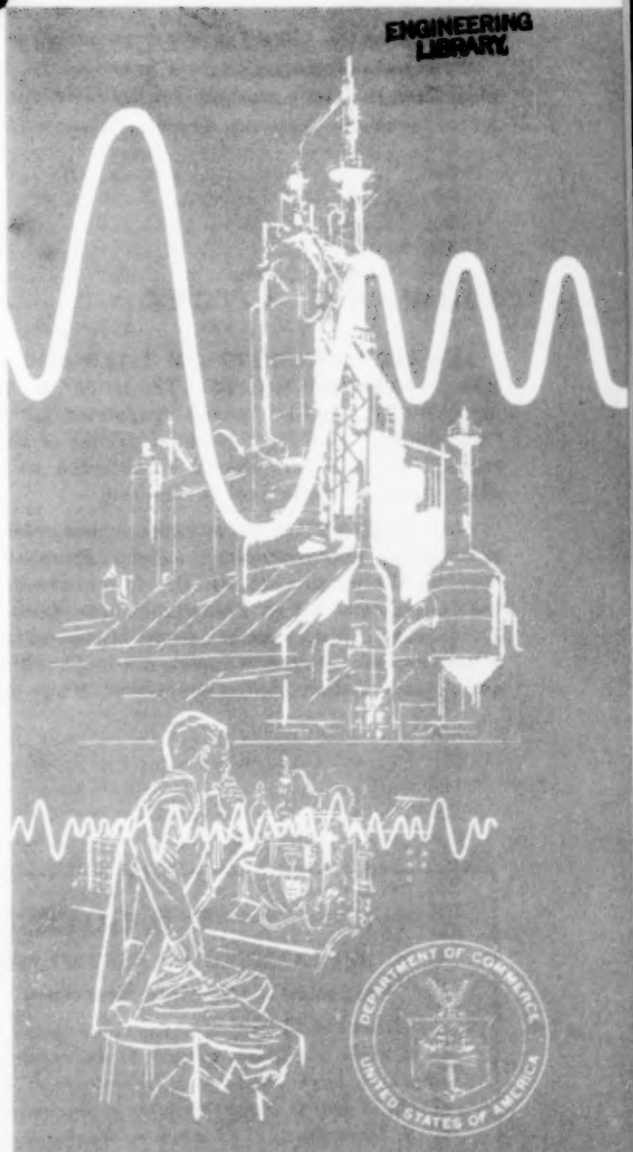

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U. S. DEPARTMENT OF COMMERCE

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U. S. Government RESEARCH REPORTS

Vol. 32, No. 3 Pp. 293-416 September 11, 1959

ASTRONOMY

Harvard Coll. Observatory, Fort Davis, Tex.
RADIO INTERFERENCE AT THE HARVARD RADIO ASTRONOMY STATION, by A. R. Thompson. Rept. on Contract AF 19(604)1394. [1958] 6p. AFCRC-TN-58-208; AD 146 852.
Order from LC mi$1.80, ph$1.80 PB 136 494

Astrophysics

Lowell Observatory, Flagstaff, Ariz.
THE ALBEDOS AND PHASE VARIATIONS OF URANUS AND NEPTUNE; THE SUN AS A VARIABLE STAR, by W. M. Sinton, H. L. Johnson, and B. Iriarte. Scientific rept. no. 1 on Contract AF 19(604)2077. Apr 59, 12p. 19 refs. Bull. nos. 95, 96; AFCRC TN-59-273; AD-213 854.
Order from LC mi$2.40, ph$3.30 PB 140 819

The photoelectric observations of Uranus and Neptune that have been made over a number of years at the Lowell Observatory have been used to test the phase variation calculated for these planets by R. L. Talley and H. G. Horak. These authors supposed that Rayleigh scattering is of prime importance in a major planet's atmosphere, and that the albedo is very high. But for ease of calculation they have assumed isotropic scattering, which should give nearly the same results. In the range of phase angles observable on Uranus and Neptune (0 to 3.1 and 0 to 1.9 degrees respectively) their computations exhibit a quadratic dependence on angle. The relation $\phi(\alpha) = 0.00020\,\alpha^2$ agrees with the calculated values within 0.0001 mag. for phase angles from 0 to 8 degrees. Thus the expected total variation of Uranus is 0.002 mag. and that of Neptune is only 0.0007 mag. A comprehensive analysis of the complete data that have been collected by the Lowell Observatory's Solar-Variations Project during the last six years is presented. An increase of about two percent in the solar constant has been found to have occurred during the last six years.

Rochester U., N. Y.
THE FLUX OF COSMIC RAY PARTICLES WITH $Z \geq 2$ OVER TEXAS, by A. Engler, M. F. Kaplon, and J. Klarmann. [1958] 33p. 36 refs. AFOSR TN-58-670; AD-162 202.
Order from LC mi$3.00, ph$6.30 PB 136 182

The fluxes of multiply charged cosmic ray particles have been measured with nuclear emulsions in a high altitude balloon flight. The identification of a-particles was based on "blo-gap" measurements and those of elements with $Z > 3$ on δ-ray densities.

Stanford Electronic Labs., Stanford U., Calif.
THE INITIAL RADIUS OF METEORIC IONIZATION TRAILS, by L. A. Manning. Technical rept. no. 22 on Contract Nonr-225(24). 20 Aug 57, 31p. 4 refs. AD-143 608.
Order from LC mi$3.00, ph$6.30 PB 137 026

The formation about the path of a meteor of regions of ionized and neutral atoms of meteoric material is investigated from the viewpoint of kinetic theory. It is found that the high initial velocity of the diffusing particles causes the trail to quickly reach an "initial radius" from which normal diffusion then proceeds. It is shown that the reflected signal may for most purposes be computed on the assumption that the trail reaches this initial radius instantaneously. The value of the initial radius is approximately 14 mean-free-paths; it is thus greater for the neutral than for the ionized trail. It is shown that at very high frequencies the initial radius may reduce the amplitude of the returned signal from under-dense trails by as much as 50 db. If heating is neglected, it is shown that the effect of initial radius on over-dense trails is marked at the same heights and frequencies as for under-dense trails.

BEHAVIORAL SCIENCES

Human Engineering

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
PROBLEMS IN HUMAN VIBRATION ENGINEERING,

by Freeman W. Cope. Rept. no. 2 on Proj. NM 18 01 12. 4 6 Mar 59, 16p. 19 refs. NADC MA-5902.
Order from LC mi$2. 40, ph$3. 30 PB 140 837

The oscillatory motion experienced by the operators of vehicles which travel over bumpy roads or through turbulent air is commonly called vibration. The effects of this motion on the driver or pilot and the methods of prevention are discussed in this paper. It would seem reasonable to suppose that vibrations can affect man only to the extent that they are transmitted to the parts of his body. Hence, the first section of this paper is devoted to the ways in which vibration is transmitted from vehicle to man, and to the methods of preventing such transmission. That portion of the vibration which reaches the man can cause a variety of anatomical, physiological, and performance changes which are discussed in the second portion of this report. This is followed by an effort to relate the experimental work on vibration to practical problems, which leads to a description of practical methods and equipment for vibration protection.

Courtney and Co., Philadelphia, Pa.
HUMAN FACTORS RECOMMENDATIONS FOR FLIGHT PROGRESS STRIPS, by Kenneth Colman, Omer Lucier, and Douglas Courtney. Memo. rept. no. 1 on Contract Nonr-2346(00). 1 Oct 57, 20p. 5 refs. Rept. no. 16.
Order from LC mi$2. 40, ph$3. 30 PB 137 355

This report is in response to a request to study the new printed flight strip and the human factors involved in its introduction, done in a brief but intensive study. The recommendations, followed by some amplification of each recommendation, compose the body of this report. These recommendations are based on a study of only one segment of the total system for processing and displaying air traffic control information.

Dunlap and Associates, Inc. [Stamford, Conn.]
ARRANGEMENT OF GROUPS OF MEN AND MACHINES: CHAPTER 8 OF HUMAN ENGINEERING GUIDE TO EQUIPMENT DESIGN, by Robert M. Thomson, Bernard J. Covner and others. Rept. on Contract Nonr-1798(00). Dec 58, 100p. 26 refs. ONR rept. ACR-33; AD-206 442.
Order from OTS $2. 25 PB 151 285

This report is a draft of material to be incorporated in the Human Engineering Guide to Equipment Design now being prepared under the direction of a Joint Services Steering Committee. It is concerned with the layout of compartments and the arrangement of components of equipment. The major concern is to provide information and recommendations for the effective design and utilization of systems which require several (or many) pieces of equipment and two or more operators.

Laboratory of Aviation Psychology, Ohio State U. Research Foundation, Columbus.
AIR TRAFFIC CONTROL SYSTEM EFFECTIVENESS AS A FUNCTION OF THE DIVISION OF RESPONSIBILITY BETWEEN PILOTS AND GROUND CONTROLLERS: A STUDY IN HUMAN ENGINEERING ASPECTS OF RADAR AIR TRAFFIC CONTROL, by J. S. Kidd and Robert G. Kinkade. Rept. on Contract AF 33(616)3612. June 58, 32p. 11 refs. WADC Technical rept. 58-113; AD-151 082.
Order from LC mi$3.00, ph$6.30 PB 140 866

This experiment evaluated the inclusion of airborne navigational aids in a radar approach control system. A comparison was made among systems in which (a) all changes in flight path were initiated by the controller, (b) pilots initiated changes in speed and altitude, and (c) pilots initiated heading changes as well as changes in speed and altitude. Heterogeneity of aircraft types was also studied by the inclusion of single-type, two-type, and four-type problems. The major results were as follows: (a) Significant improvement in system performance, as measured by such criteria as control time, was obtained by providing airborne position information equipment. (b) Superior system performance occurred for mixed aircraft types, in the sense that relative delay was reduced.

Rome Air Development Center, Griffiss AFB, N. Y.
THE SPECIFICATION AND DESCRIPTION OF SURFACE COLORS, by Kenneth J. Crain. Dec 58, 39p. 14 refs. RADC TN-58-333; AD-205 924.
Order from LC mi$3.00, ph$6.30 PB 139 573

The present paper represents an attempt to provide, in as complete but concise a manner as possible, all the information needed for the specification and description of surface colors. Analysis is made of colors in terms of the CIE chromaticity diagram, and the method of converting from this system of notation (CIE) to the Munsell (and vice-versa) is given. In addition, procedures are described for the estimation of degree of perceptible difference between colors.

Personnel and Training

Adjutant's General's Office, Washington, D. C.
EVALUATION OF EXPERIMENTAL PREDICTORS FOR SELECTING ARMY HELICOPTER PILOT TRAINEES. II, by Joseph Zeidner, Harold Martinek, and Alan A. Anderson. Dec 58, 32p. 4 refs. PRB Technical research note 101.
Order from LC mi$3.00, ph$6.30 PB 139 670

The present research describes the analysis of the second of four groups of tests from which an operational selection battery for predicting helicopter pilot trainee success is being developed.

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
THE EFFECT OF DISPLAY INTERRUPTION ON TRANSFER OF TRAINING BETWEEN TASKS OF DIFFERENT CONTROL SENSITIVITY, by Theodore E. Cotterman and Delos D. Wickens (Ohio State U.) Rept. on Simulation Requirements for Operation Trainers, Contract AF 33(616)3076. Mar 58, 25p. 10 refs. WADC Technical rept. 57-548; AD-131 027.
Order from LC mi$2. 70, ph$4. 80 PB 140 830

This study was designed to investigate the relationship between amount of transfer of skill in two-dimensional tracking and degree of physical similarity between training and test control sensitivity when the display was interrupted periodically during both training and test. Interrupting the display simulated the situation in which the operator is forced to divert his attention from tracking to perform other tasks. Tracking with an interrupted display apparently is not more sensitive to differential transfer effects attributable to differences in control sensitivity than is tracking with a continuous display. These results are compatible with the notion that the general features of a task are learned in early practice and only later, unique aspects are leanred from which differential transfer effects may result.

Institute of Personality Assessment and Research, U. of California, Berkeley.
AN ASSESSMENT STUDY OF AIR FORCE OFFICERS. PART III. ASSESSMENT CORRELATES OF CRITERIA OF OFFICER EFFECTIVENESS, by Frank Barron, Jack Block and others. Rept. on Contract AF 18(600)8. Dec 58, 54p. 7 refs. WADC TR-58-91, Pt. 3; AD-210 218.
Order from LC mi$3.60, ph$9.30 PB 140 910

Criterion data were gathered from Promotion Board Ratings, Officer Effectiveness Reports, superior officers' ratings, and from structured interviewes with the officers. Overlap in criteria was reduced by factor analysis. Separate sections deal with predictability of criteria from three different sources. Officers rating high on each criterion are described in terms of assessment variable correlates.

Institute of Personality Assessment and Research, U. of California, Berkeley.
AN ASSESSMENT STUDY OF AIR FORCE OFFICERS. PART IV. PREDICTABILITY OF A COMPOSITE CRITERION OF OFFICER EFFECTIVENESS, by Harrison G. Gough. Rept. on Contract AF 18(600)8. Dec 58, 77p. 27 refs. WADC TR-58-91, Part 4; AD-210 219.
Order from LC mi$4.50, ph$12.30 PB 140 865

The purpose of this volume is to reduce the data for 11 criteria to a practical composite criterion and to organize data concerning 631 test and assessment variables for prediction of the composite criterion. Evaluation of the criteria led to selection of three for combination in a Criterion Index. From correlations of the predictor variables with this criterion, 41 were identified that maintained significant relationships. By cluster analyses, these were reduced to homogeneous composite predictors that could be defined as psychological dimensions of officer effectiveness. By item analysis, lists of adjectives differentiating high-scoring from low-scoring officers on the Criterion Index were made, and extensive personality questionnaire data were reduced to two brief scales keyed to predict the Criterion Index. The results identify both the group-testing instruments and individual assessment devices that hold promise for identification, early in an officer's career, of those capable of becoming outstanding commanders. (See also PB 140 910)

Institute of Personality Assessment and Research, U. of California, Berkeley.
AN ASSESSMENT STUDY OF AIR FORCE OFFICERS. PART V. SUMMARY AND APPLICATIONS, by Donald W. MacKinnon. Rept. on Contract AF 18(600)8. Dec 58, 56p. 20 refs. WADC TR-58-91; Pt. 5; AD-210 220.
Order from LC mi$3.60, ph$9.30 PB 140 868

This volume summarizes significant relationships between predictor and criterion variables. Inferences from these relationships provide a comparative evaluation of the criteria of officer effectiveness and lead to selection from the experimental devices or instruments proposed for inclusion in a program of officer assessment. (See also PB 140 865)

Michigan State U., East Lansing.
SPATIAL ABILITIES AND SELECTED ELEMENTS OF AIR FORCE TECHNICAL JOBS, by Willard G. Warrington and Joe L. Saupe. Rept. on Contract AF 41(657)132. Dec 58, 49p. 11 refs. WADC TR-58-491; AD-207 336.
Order from LC mi$3.30, ph$7.80 PB 140 894

A three-dimensional performance-type criterion was developed that simulated perceptual elements identified in 20 selected Air Force technical specialties. The criterion measure, the Space Survey Test, a measure of general mental ability, and a measure of mechanical experience and interest were administered to 273 high school junior boys. Analyses of these data indicate that the Space Survey Test has considerable power for predicting the criterion. This predictive power is independent of the measures of mental ability and mechanical experience and further research concerning the advisability of including the Space Survey Test in the Airman Classification Battery is therefore warranted. These data suggest that the multi-score Space Survey Test is only slightly more effective in predicting the criterion than one of the sub-scores, Spatial Manipulation-A. Special attention should be given to this subtest in future validation research.

Naval Personnel Research Field Activity, Washington, D. C.
AN INVITATIONAL APPROACH FOR ENCOURAGING APPLICATIONS FOR ADVANCED TRAINING, by Russell A. Clark and Aaron J. Spector. Jan 59, 22p. 3 refs. BuPers Technical Bulletin 59-1.
Order from LC mi$2.70, ph$4.80 PB 140 838

The invitational approach to encouraging applications assures that the quality of applicants will be as select as is desired, and that the number of applicants is sufficient for selection purposes, but not so large that an undue portion must be rejected. It is an efficient and inexpensive method which yields secondary gains in terms of morale and the dissemination of information. The invitational approach should be used as an adjunct to current recruiting techniques, and as a method of disseminating information about opportunities in the Navy to selected groups.

Naval Training Device Center, Port Washington, N. Y.
HUMAN FACTORS IN MAINTENANCE. PART I. AN

INVESTIGATION OF MAINTENANCE PROBLEMS OF A REPRESENTATIVE TRAINING DEVICE, by Milton W. Horowitz and Carl F. Wells (Educational Research Corp.) Jan 58, 39p. 1 ref. Technical rept. NAVTRADEVCEN-20-OS-23-1.
Order from LC mi$3.00, ph$6.30 PB 140 906

The Aviation Psychology Division of the U. S. Naval Training Device Center has established a program to investigate and solve the pertinent man-machine relationships necessary for effective maintenance. Part I (Reported here) was designed to determine the nature and scope of maintenance problems in the field.

Operations Research Office, Johns Hopkins U., Chevy Chase, Md.
COMMUNICATION BETWEEN THE SCIENTIST AND THE MILITARY, by L. D. Flory. Dec 58, 29p. 18 refs. ORO Staff Paper no. 75.
Order from OTS $0.75 PB 151 666

Contents:
The increasing need for cooperation
- Growth of the role of the scientist since World War II
- Professional partnership

General concepts and problems involved in research
- Administration for research
- Administration of research
- Communication between researchers
- Access to information
- Environment for research
- Planning for research
- Military vs industrial laboratories and facilities
- Security restrictions

The civilian scientist in the military service
- Peacetime supply of scientists
- Expanded civil schooling programs
- Professional prestige
- Freedom in research

The civilian scientist in research contracts with the military
- Sources of hostility
- Importance of publication to the scientist

Personnel Lab., Lackland AFB, Tex.
SCHOOL AND JOB VALIDATION OF SELECTION MEASURES FOR AIR TRAFFIC CONTROL TRAINING, by Leland D. Brokaw, Apr 59, 19p. 1 ref. WADC TN-59-39; AD-214 884.
Order from LC mi$2.40, ph$3.30 PB 140 863

Instructor ratings and lecture grades were collected at the end of the course. Approximately one year after the men had graduated from the school they were identified on the job to collect supervisory ratings of the proficiency, as well as data on recommendations for promotion. A battery of tests suitable for administration as a screening device was selected on the basis of the training validation. These tests displayed satisfactory validity on the job, and produced a composite validity significant beyond the 1-per-cent level for on-the-job criteria. Of several experience variables, CAA certification proved the most valid and added appreciably to accuracy of predicting training criteria.

School of Aviation Medicine, Randolph AFB, Tex.
ADAPTABILITY SCREENING OF FLYING PERSONNEL: PRELIMINARY ANALYSIS AND VALIDATION OF CRITERIA OF ADAPTABILITY TO MILITARY FLYING, by A. L. Kubala. Nov 58, 25p. 19 refs. Rept. 58-121.
Order from LC mi$2.70, ph$4.80 PB 139 576

Factor analyses of a large number of criterion measures collected during primary pilot training on a sample of aviation cadets yielded seven factors: Military Aptitude, Ability Personal Adjustment Flying Performance, Age, Military Conformity, and Educability. Examination of the relationships between a posttraining criterion measure, derived from information in the sub ects' AF Form 66, and numerical estimates of the factors and three experimental adaptability selection tests indicated that the majority of the training level criterion measures and experimental tests could predict estimates of posttraining effectiveness.

Utah U., Salt Lake City.
IDENTIFICATION OF COMMUNICATION ABILITIES IN MILITARY SITUATIONS, by Calvin W. Taylor, William R. Smith and others. Rept. on Contract AF 18(600)1211. June 58, 62p. 31 refs. WADC TR-58-92; AD-151 043.
Order from LC mi$3.90, ph$10.80 PB 140 829

This research was designed to define the dimensions of communication abilities, to provide techniques for measuring performance in communication in military situations, and to determine test predictors of the communication abilities thus defined and measured. A list of communication requirements was abstracted from descriptions of airman jobs. Tests were assembled assumed to be predictive of these abilities. From their administration in two large test batteries to samples of airmen, the data were analyzed for selection of predictors, to include with criterion variables, in a validation batter. The report supplies extensive data useful for the further development of selection and classification procedures for Air Force personnel primarily concerned with communication tasks.

Vanderbilt U., Nashville, Tenn.
THE SPECIAL INSTRUCTIONAL PROBLEMS OF TEACHING AVIATION IN THE CLASSROOM, by Stanford C. Ericksen. Technical rept. on Contract Nonr-2149(01). Aug 58, 47p.
Order from LC mi$3.30, ph$7.80 PB 140 878

This manual represents a summary document which makes a direct attempt to synthesize transfer of training information for the possible improvement of the aviation training program as an example of one way to translate the already available knowledge from the research and theory domain into the language of a typical and highly relevant non-psychology audience--the beginning teacher. The particular purpose of this type of manual is to give the new instructor a perspective, a better understanding of how a training program incorporates the major variables which control the learning process. The content of the manual, therefore, is intended to give this instructor-specialist some understanding of the major psychological concepts that lie

behind successful teaching and learning procedures. The basic pattern is to present a psychological generalization about learning, e.g., Over-learning--say something about it, and then illustrate its application in the specific classroom frame of reference.

Washington U., St. Louis, Mo.
GAIN IN PROFICIENCY AS A CRITERION IN TEST VALIDATION, by Winton H. Manning and Philip H. DuBois. Technical rept. no. 4 on Naval Air Technical Training, Contract Nonr-816(02). Oct 57, 6p. 4 refs.
Order from LC mi$1.80, ph$1.80 PB 137 315

Subjects were 213 trainees from 13 successive classes with ratings of second class petty officer or above. On the first day of training, one form of a comprehensive examination in aircraft ignition was administered as the pre-training proficiency measure This test consisted of 60 five-choice, multiple response questions. Following three weeks of training in aircraft ignition an alternate form of this achievement test, also 60 items in length, was administered as the regular final examination. These two tests, one administered on the first day and another on the last day of training, served as bases for computing two gains scores: residual gain and crude gain. Scores on the second test alone were used as the measure of final standing in the course.

Psychology—Space Perception

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
EXPERIMENTS ON VIGILANCE: PERFORMANCE ON A SIMPLE VIGILANCE TASK IN NOISE AND IN QUIET: THIRD IN A SERIES, by Harry J. Jerison and Ronald A. Wallis (Antioch Coll.). Rept. on Operator Performance in High Energy Noise Fields, Contract AF 33(616)3404. June 57, 15p. 7 refs. WADC Technical rept. 57-318; AD-118 337.
Order from LC mi$2.40, ph$3.30 PB 140 913

Twenty male undergraduate volunteers worked on a simple vigilance task without interruption for 1 3/4 hours in noise (112.5 db SPL) and 1 3/4 hours in quiet (79 db SPL). The performance function was the typical one found in such tasks; performance dropped off rapidly after an initial high level. There was no differentiation, however, between performance in the noise session and in the quiet session. This result, which differs from previous results at this and at other laboratories on effects of noise on "vigilance", is explained on the basis of the absence of a need for flexibility of attention for performance on the simple "vigilance" task used here and the presence of such a need for performance on "vigilance" tasks in which an effect of noise was found.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
TWO FORMAL MODELS FOR MORAL PRINCIPLES, by Patrick Suppes. Technical rept. no. 15 on Contract Nonr-225(17). 1 Nov 57, 41p. 12 refs.
Order from LC mi$3.30, ph$7.80 PB 137 114

The individual decision model and the social decision model are considered.

California U., Los Angeles.
EFFECTS OF DIFFERENT TRAINING METHODS ON FREE ASSOCIATION: ORIGINALITY AND UNUSUAL USES, by Irving Maltzman, William Bogartz, and Seymour Simon. Technical rept. no. 1 on Contract Nonr-233(50). Aug 58, 10p. 8 refs.
Order from LC mi$1.80, ph$1.80 PB 140 891

The experimental results indicate that the procedure of repeatedly evoking different responses to the same stimulus words facilitates the occurrence of uncommon responses to other stimulus items. A more general facilitating effect appears to be produced in this manner than by the procedure of evoking different responses by presenting different stimuli.

City Coll. of the City of New York.
THE ACCEPTANCE OF NEW REFERENCE GROUPS, by Ruth E. Hartley. Final rept. on Contract Nonr-1597(01). 31 Aug 58, 38p. 3 refs.
Order from LC mi$3.00, ph$6.30 PB 140 898

The design of the project provided for the examination of variables falling into the following categories: perceptual-conceptual, relating to the individual's social perception of and concepts about a new group; historical-relational, concerning relationships between the new group and previously established groups; individual-group congruity, relating to the compatability between characteristics of the new group and personal aspects of the individual; and personal, involving generalized personal qualities which appeared to be related to the acceptance of new groups. The specific variables examined are indicated in the hypotheses presented in Sections II and III.

Connecticut Coll., New London.
MANUAL FOR THE BEHAVIOR INTERPRETATION INVENTORY FORM 59R, by George Moeller and Mortimer H. Applezweig. Technical rept. no. 2 on Motivation Research Project, Contract Nonr-996(02). Nov 57, 76p. 9 refs.
Order from LC mi$4.50, ph$12.30 PB 137 138

This manual describes a multiscale measure of motivation, The Behavior Interpretation Inventory (BII), developed as part of a five-year study of the relation of motivation to psychological stress. The four motives the BII was designed to measure are described and the rationale of the inventory is set forth as explicitly as possible. A copy of the BII and a scoring key are provided along with directions for its administration and scoring. Normative, reliability, and validity data are presented for a recommended scoring system, and for two scoring systems described fn earlier reports.

Connecticut U., Storrs.
PARTIAL RESPONSE IDENTITIES IN VERBAL GENERALIZATION, by W. A. Bousfield, G. A. Whitmarsh, and J. J. Danick. Technical rept. no. 26

on Contract Nonr-631(00). Aug 58, 17p. 8 refs.
Order from LC mi$2.40, ph$3.30 PB 140 893

The paper reports the results of an experimental study making use of pairs of words with one member of each pair serving as the trained word and the other member as a test word. The positive correlations between the indices of predicted generalization for the word pairs and the extent of generalization experimentally determined for each pair yield support for the proposed theory.

Connecticut U., Storrs.
PARTIAL RESPONSE IDENTITIES IN ASSOCIATIVE CLUSTERING, by W. A. Bousfield, G. A. Whitmarsh, and H. Berkowtiz. Technical rept. no. 27 on Contract Nonr-631(00). Aug 58, 9p. 8 refs.
Order from LC mi$1.80, ph$1.80 PB 140 892

Associative clustering has been defined as the tendency of Ss to recall the items of a randomized stimul-word list in sequences of related words. This study employed associative clustering as a device for determining the validity of an index of word relatedness based on partial response identities. This index, termed the measure of relatedness, Mr, is the percentage of implicit verbal responses which two verbal stimuli have in common. The unique feature of this measure is that it includes what Bousfield, Cohen, and Whitmarsh have termed the distinctive representational response. Since this response is assumed to be uniquely representative of any given word, it is labelled as the word itself. Evidence of the validity of ot the MR was found in an obtained positive correlation between such scores for pairs of words and the incidence of the clustering of these pairs in free recall.

Educational Testing Service, Princeton, N. J.
SEX DIFFERENCES IN THE RELATIONSHIP BETWEEN TEST SCORES AND PERFORMANCE ON MECHANICAL JOBS, by Gerald C. Helmstadter. Rept. on Contract Nonr-694(00). Nov 57, 10p. 7 refs.
Order from LC mi$1.80, ph$1.80 PB 137 139

The study was to answer in part the question of whether current tests and procedures are appropriate for selecting women to work in mechanical jobs. A short battery of tests was given to men and women who were being trained in the assembly of typewriters. The criterion that was to be predicted with this battery was the length of time that the various subjects required to learn this assembly process to a specified degree of proficiency. Analyses of the data showed that none of the tests were significantly related to this particular criterion for either men or women. The criterion was considered unsuitable for the present purpose, and no information on the appropriateness of the tests for men and women could be obtained.

Educational Testing Service, Princeton, N. J.
A STUDY OF TESTS OF REPORT WRITING ABILITY, by Norman Frederiksen. Rept. on Contract Nonr-2338(00). Aug 58, 34p. 2 refs.
Order from LC mi$3.00, ph$6.30 PB 140 877

A number of experimental tests designed to measure qualities important in report writing were administered to 506 students at a graduate school of business administration. Data used in the study included scores on the experimental tests, the Cooperative English Test, and the Admission Test for Graduate Study in Business, as well as first-year average grades and grades in a report writing course. For a subgroup of 162 students, evaluations of paragraphs and sentences from three reports written by each student were also obtained. Separate "set" and "content" scores were obtained from two of the experimental tests. The best of the experimental tests for predicting writing ability are Recognizing Ambiguities (content score), Alternative Expressions (set score), and the Interlinear Test.

Fels Group Dynamics Center, U. of Delaware, Newark.
FACTORS PRODUCING DEFENSIVE BEHAVIOR WITHIN GROUPS, by Jack R. Gibb. Jacqueline Goodchilds and others. Annual rept. for 1 Jan-15 Nov 57 on Contract Nonr-2285(01). [1957] 10p. 6 refs.
Order from LC mi$1.80, ph$1.80 PB 137 122

Louisiana State U. [Baton Rouge]
SHORT-CUTS FOR HAND-CALCULATING MEASURES OF AGREEMENT AMONG MEMBERS AND RELATIVE SUCCESSFUL LEADERSHIP, by Bernard M. Bass. Technical rept. no. 19 on Contract N7onr-35609. May 58, 12p. 4 refs.
Order from LC mi$2.40, ph$3.30 PB 139 503

This report is to provide and prove the correctness of short-cuts for calculating measures of relative success and changes in average agreement among members.

Louisiana State U., Baton Rouge.
SOME EFFECTS OF FEEDBACK ON BEHAVIOR IN GROUPS, by Margaret W. Pryer and Bernard M. Bass. Technical rept. 13 on Behavior in Groups, Contract N7onr-356(09). Nov 57, 16p. 13 refs.
Order from LC mi$2.40, ph$3.30 PB 137 058

Leadership evolves partly as a function of the differential ability of members to satisfy the group's needs. The present study examined the significance of knowledge of results, a direct cue to need satisfaction, to the objectively assessed performance of members and their interaction.

Louisiana State U., Baton Rouge.
TEST OF A PROPOSED THEORY OF LEADERSHIP, by Bernard M. Bass. Annual rept. no. 3 on Behavior in Groups, Contract N7onr-356(09). 15 Nov 57, 13p. 13 refs.
Order from LC mi$2.40, ph$3.30 PB 137 057

The following divisions are considered: I. Nature of Studies, II. Some results to date, and III. Plans.

Maryland U., College Park.
MEANINGFULNESS AND TRANSITIONAL DEPENDENCY AS FACTORS IN LEARNING AND RECALL, by Richard C. Gonzalez and Charles N. Cofer. Technical rept. no. 8 on Learning, Retention and Recovery of Meaningful Materials, Contract Nonr-595(04). Aug 57, 13p. 7 refs. AD-140 383.
Order from LC mi$2.40, ph$3.30 PB 137 027

Two exploratory experiments were carried out to show differences in learning or retention as a function of meaningfulness when transitional dependencies are held roughly constant. Experiment I allowed the comparison of sentences designed like proverbs to be rich in implication with comparable but less meaningful sentences. Experiment II was conducted with word pairs. Transitional dependencies (the extent to which the response member of the pair occured in free association to the stimulus member of the pair) were held within a narrow range of variation. Meaningfulness was defined and measured according to the method of Noble (Psychol. Rev. 59:421-430, 1952). Results resembled those on clustering phenomena of Gonzalez and Cofer where long range retention is enhanced by processes other than strict associative ones.

Maryland U., College Park.
STUDY OF CLUSTERING IN VERBS, ADVERBS AND FOUR WORD SEQUENCES, by Richard C. Gonzalez and Charles N. Cofer. Technical rept. no. 16 on Learning, Retention and Recovery of Meaningful Materials, Contract Nonr-595(04). Aug 57, 11p. 4 refs. AD-140 390.
Order from LC mi$2.40, $3.30 PB 137 041

Experiment I was designed to determine whether verbs and adverbs would show the same phenomena as adjectives and nouns, i.e., would also cluster and if so were their modifying effects similar to those of adjectives and nouns. Subjects (98) were divided into a verb control group, an adverb control group, a verb-adverb paired presentation group, and an adverb-verb paired presentation. The groups were read a stimulus list and asked for recall immediately and again 5 min later. The time between the first and second recalls was fitted with a cloze procedure test. Results demonstrated that verbs and adverbs are subject to clustering. The aim of experiment II was to combine longer, more complex sequences of connected material. Adjectives and nouns were combined with the verbs and adverbs to form 4-word sequences of adjective-noun-verb-adverb combinations. The subjects (96) were treated as in experiment I. Group I was read a list of 40 four-word sequences once and asked to recall as many of the sequences as possible. Group II was read the same material 3 times and asked for the same recall as I. Group III was read the same material once and asked to recall only the noums. For group IV, the stimulus list was shortened to contain only twenty 4-word sequences, 5 from each category. The task called for the recall of the 4-word sequences. All groups displayed a marked amount of clustering although facilitation, in the sense of an absolute increase in clustering, was not evidenced. The 4-word sequence did not reduce organization.

Minnesota U., Minneapolis.
CONNOTATIVE MEANING AS A DETERMINANT OF STIMULUS GENERALIZATION, by Charles F. Dicken. Doctoral thesis. Technical rept. no. 23 on Studies on the Role of Language in Behavior, Contract N8onr-662(16). Aug 58, 62p. 14 refs.
Order from LC mi$3.90, ph$10.80 PB 140 876

The research report was designed as a test of a two-stage hypothesis. The first stage of the hypothesis states that the generalization observed in meaningfully related verbal materials occurs on the basis of a representational mediation process. The mediation process is a theoretical construct with which the meaning of a sign is identified in the Osgood theory. The second stage of the hypothesis concerns the capacity of a measuring instrument, the Semantic Differential, for measuring the meanings of verbal signs. The Semantic Differential attempts to measure an aspect of meaning through the elicitation of verbal responses to the materials being scaled in a combined judgmental-associative context defined by the use of polar adjective scales. An experimental technique was devised which employed members of clusters of words of a high degree of scaled meaning similarity as stimuli in original learning and other members of the same cluster as generalization stimuli. Two initial experiments indicated that generalization occurs at a satisfactory level of statistical significance if the cluster of generalization stimuli is used as the unit of analysis. Two additional experiments were done which entailed the use of the same stimuli with the context changed by an altered pairing of the cluster, again substantiating the generalization effect. A final set of two experiments which were exact replications of the first set were done to assess the reliability of the experimental method, to determine more precisely the role of change of context in the obtained generalization, and to provide a more stable index of the "functional" or "nonfunctional" quality of individual generalization stimuli. Several implications for further research with a population of Semantic Differentially scaled words are contained in the outcome of the experiments and supplementary analyses.

Quartermaster Research and Engineering Center, Natick, Mass.
RELATIONSHIP BETWEEN INDIVIDUAL PERSONALITY VARIABLES AND BODY TEMPERATURE RESPONSE PATTERNS IN THE COLD, by B. J. Fine and H. F. Gaydos. Mar 59, 16p. 17 refs. Technical rept. EP-106.
Order from LC mi$2.40, ph$3.30 PB 140 938

After completing a personality inventory (MMPI) and being measured for weight, height, and body fat, 57 male volunteer test subjects were exposed nude to successive climatic conditions of 70°F., 50% R.H., no wind; 50°F., 50% R.H., 5 mph wind; and 78°F., 50% R.H., no wind; for periods of 30, 75, and 115 minutes respectively. Skin and rectal temperatures were recorded during all three periods; subjective responses re garding feelings of warmth were obtained during the 75-minute cold exposure period. Major findings were: (1) subjects whose combined scores on the personality measure deviated widely from the group norm took significantly longer than less deviant subjects to show a rise in rectal temperature following exposure to the cold, (2) heavy, large men felt warmer than light, small men during

exposure to the same cold condition, (3) heavy, large men showed the same rectal temperature change in the cold as did light, small men, (4) light, small men showed faster rectal temperature recovery rates than heavy, large men.

School of Aviation Medicine, Randolph AFB, Tex.
EFFECTS OF IONIZING RADIATION UPON HUMAN PSYCHOMOTOR SKILLS, by Robert B. Payne. Dec 58, 10p. 3 refs. Rept. no. 59-29.
Order from LC mi$1.80, ph$1.80 PB 139 540

Two sets of observations are reported. The first set is concerned with the question whether a given air dose will have a greater effect when delivered in a single exposure than when delivered in a series of fractional exposures, while the second can be considered analogous to a straightforward dose-response study involving relatively high exposure levels.

Texas A. and M. Research Foundation, College Station.
STUDIES OF ADAPTATION LEVEL PHENOMENA IN PERSONALITY, by Warren C. Bonney and Clay E. George (Arizona State Coll.). Technical rept. no. 2 on Contract Nonr-2119(01). 20 Aug 58, 18p. 2 refs.
Order from LC mi$2.40, ph$3.30 PB 140 875

Adaptation level theory presents the most meaningful and most manipulative model within which this kind of measurement may be achieved. A L Theory has the added advantage of lending itself readily to quantifiable data.

Yale U., New Haven, Conn.
DOES GROUP PARTICIPATION WHEN USING BRAINSTORMING FACILITATE OR INHIBIT CREATIVE THINKING? by Donald W. Taylor, Paul C. Berry, and Clifford H. Block. Technical rept. 1 on Contract Nonr-609(20). Nov 57, 35p. 8 refs.
Order from LC mi$3.30, ph$7.80 PB 137 142

An experiment designed to determine whether group participation when using brainstorming facilitates or inhibits creative thinking. In a preliminary lecture to the entire group, the origin, nature, and widespread use of brainstorming was described, the purpose being to create interest in the procedure and as favorable as possible an attitude toward it. After instructions which were designed to ensure both high motivation and full understanding of the four basic rules of brainstorming, each of the 12 groups and of the 48 individuals attacked the same three problems in the same order. All experimental sessions were recorded using appropriate sound equipment, and later essentially complete typewritten transcripts were made of the responses of each group and each individual to each of the three problems. The results of the several analyses were both clear-cut and consistent.

Missouri U., Columbia.
INVESTIGATION OF MICROORGANISMS OF THE GROUP MYXOMYCETES, by J. Levitt. Final rept. for 1 June 51-31 Aug 57 on Contract Nonr-327(00). Aug 58, 5p. 1 ref.
Order from LC mi$1.80, ph$1.80 PB 140 890

During the first phase of this project a method was developed for mass culture of the plasmodium of Physarum polycephalum. During the second phase, treatments with antibiotics were developed that permitted freeing the plasmodium of all contaminants. In the third phase, two-membered culture with a species of Aspergillus was investigated.

Office of Naval Research, Washington, D. C.
PHYSIOLOGICAL PSYCHOLOGY: SYMPOSIUM [NO. 2] HELD AT THE U. S. NAVAL SCHOOL OF AVIATION MEDICINE, PENSACOLA, FLORIDA, MARCH 19-21, 1958. [1958] 242p. 169 refs. ONR Symposium rept. ACR-30.
Order from LC mi$11.10, ph$37.80 PB 140 916

Contents:
The physiological basis of taste psychophysics
Electrical activity in the medulla following taste stimulation
Threshold of thermal sensation
Developments in vibratory communications
The growth of subjective magnitude with stimulus intensity
Some preliminary psychophysical data concerning time-variant stimuli
Hunger contractions and hunger pangs: are they normal?
Thalamo-cortical relationships on the auditory nervous system and their significance for auditory discrimination
A second look at the sensory systems, end organ to cortex
Comments on the problem of individual differences in psychophysiological research
Some biopsychology of thinking, imagery, and memory
Unit activity in human extraocular muscles
Visual effects of minimal eye movements
The effect of method upon the course of light adaptation
Studies on photosensitization
Research on the visual perception of motion and change
Discriminations of a unilaterally color-blind subject
Visual detection in a uniformly luminous field
Auditory responses in reptiles
Recent observations and interpretations of cochlear action
Some cortico-cortical connections of the cat's auditory system
The articulation index: the multiple-choice intelligibility tests
Experimental sensory deprivation

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
CLINICAL EVALUATION OF LOW G TOLERANCE, by George D. Zuidema, Sanford L. Cohen, and Albert J. Silverman. Rept. on Biophysics of Acceleration. July 58, 15p. 13 refs. WADC Technical note 57-268; AD-130 918.
Order from LC mi$2.40, ph$3.30 PB 140 871

The patients were studied by a team using cardiovascular, neurohormonal, bioelectric, psychologic, and psychiatric techniques. Results showed that the patients could be divided into four groups: (1) six patents had no demonstrable physiological or psychological difficulties; (2) two subjects had been incorrectly performing protective maneuvers; (3) two patients had inadequate vasomotor reflexes; (4) two subjects had psychologic characteristics thought to be important determinants of lowered acceleration tolerance. The relationship of cardiovascular and psychophysiological factors in tolerance to g forces is illustrated.

Air Crew Equipment Lab., Naval Air Material Center, Philadelphia, Pa.
TEMPERATURE SENSATIONS ACCOMPANYING CHANGES IN THE SKIN TEMPERATURE, by Edwin Hendler. 20 Aug 57, 28p. 21 refs. NAMC-ACEL-350.
Order from LC mi$2.70, ph$4.80 PB 136 484

Using a radiometric apparatus to measure skin temperature while heating and cooling the skin surface, it was found that in the skin temperature range from 32° to 37°C reports of temperature sensation were best correlated with rate of change in skin temperature. The threshold for warmth sensation was found to be an increasing skin temperature change rate of between 0.001° to 0.002°C per second; for cold sensation, a decreasing rate of between 0.005° and 0.006°C per second evoked threshold sensation. When the skin temperature did not change, sensation reports tended to be repetitions of immediately preceding reports. Rapid fluctuations in skin temperature were not accompanied by temperature sensations which could be ascribed to the fluctuations themselves

Audiology Lab., Northwestern U., Evanston, Ill.
ON THE DETECTION OF EXTREMELY SMALL CHANGES IN SOUND INTENSITY, by James F. Jerger, Joyce Lassman Shedd, and Earl Harford. Nov 58, 10p. 26 refs. AFSAM rept. no. 58-127.
Order from LC mi$1.80, ph$1.80 PB 139 648

A unique method for the clinical assessment of differential intensity discrimination is described. Findings on selected individual cases are reported. Results obtained in 75 patients with various types of hearing loss are reviewed.

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
EFFECTS OF AGEING, DRUGS, EXERCISE AND OTHER STRESSES ON THE ELASTIC CHARACTERISTICS OF THE INTACT LIVING HUMAN AORTA, by Freeman W. Cope. Rept. no. 8 on Proj. NM 11 01 12.6. 19 Nov 58, 22p. 15 refs. NADC-MA-5815.
Order from LC mi$2.70, ph$4.80 PB 139 529

A method has been developed by which aortic distensibility characteristics can be computed in the intact living human, if systolic and diastolic arterial pressures, heart rate and cardiac output are known. In this way the aortic characteristics of a large series of normal men of different ages were computed. Comparing these results with measurements on excised aortas, a more pronounced trend toward increasing aortic stiffness with increasing age is evident in living than in dead aortas. Nor-epinepherine and exercise apparently cause the living aortas to constrict but to become more distensible. The same change occurs after 30 minutes of high spinal anesthesia. The ganglionic blocking agents hexamethonium, pentamethonium, and tetraethylammonium usually cause the living aorta to become stiffer, presumably due to dilatation. The aortas of patients with pulmonary disease usually react in different fashion to exercise or tetraethylammonium. The increased aortic distensibility that occurs with the hypertension induced by nor-epinepherine or exercise acts as a compensatory mechanism by decreasing systolic pressure. (See also PB 139 528)

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
AN ELASTIC RESERVOIR THEORY OF THE HUMAN SYSTEMIC ARTERIAL SYSTEM USING CURRENT DATA ON AORTIC ELASTICITY, by Freeman W. Cope. Rept. no. 7 on Proj. NM 11 01 12.6. 7 Nov 58, 32p. 40 refs. NADC MA-5814.
Order from LC mi$3.00, ph$6.40 PB 139 528

A review of the literature of aortic elasticity data leads to the conclusion that the pressure-volume curves of the human aorta can be reasonably well approximated by parabolas, while a straight line approximation proved inadequate. By using the above relationship and assuming flow through the peripheral vascular system to be directly proportional to the pressure difference across it, two equations are derived which relate systolic and diastolic blood pressures, cardiac output, pulse rate, peripheral resistance, and two constants of aortic elasticity. Pulsewave transmission phenomena are ignored. These two equations can be solved simultaneously for any two variables in terms of the others. When values computed from these equations are compared with experiment, the errors are usually less than 5%, provided errors due to inaccurate measurements of the aortic elasticity constants are avoided.

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
SOME CLINICAL AND PHYSIOLOGICAL IMPLICATIONS OF A RECENT ELASTIC RESERVOIR THEORY OF THE HUMAN SYSTEMATIC ARTERIAL SYSTEM, by Freeman W. Cope. Rept. no. 9 on Proj. NM 11 01 12.6. 25 Nov 58, 28p. 10 refs. NADC-MA-5816.
Order from LC mi$2.70, ph$4.80 PB 139 524

Equations describing the physical characteristics of the human systemic arterial system have been developed which describe the interrelationship between systolic and diastolic blood pressures, cardiac output, heart rate, aortic elasticity and total peripheral resistance. Typical values for the variables are substituted in the basic equations to show the systolic and diastolic pressure changes in certain clinically important or didactically useful situations. The effects on systolic and diastolic pressures of changing either peripheral resistance or cardiac output or heart rate or aortic elasticity alone are shown. The effects on pulse pressure of varying cardiac output and peripheral resistance while holding mean arterial pressure constant are demonstrated. Compensatory mechanisms in hypertension, exercise and shock are explored. (See also PB 139 529)

Bureau of Applied Social Research, Columbia U., New York.
A SURVEY OF STUDIES CONTRASTING THE QUALITY OF GROUP PERFORMANCE AND INDIVIDUAL PERFORMANCE: 1920-1957, by Irving Lorge and Marlin Brenner. Technical rept. no. 1 on Contract Nonr-266(43). 15 Oct 57, 53p. 74 refs.
Order from LC mi$3.60, ph$9.30 PB 137 313

This is an analysis of studies done in the years 1920-1957 which contrast the quality of performance by individuals and by groups in diverse situations. A number of studies are included which add to this aspect of human behavior.

Hofstra Coll., Hempstead, N. Y.
A CRITICAL ANALYSIS OF THE LITERATURE DEALING WITH THE EFFECT OF INTERMITTENT SOUND STIMULI ON PERFORMANCE, FEELING, AND PHYSIOLOGY, WITH PRELIMINARY WORK TOWARD AN EXPERIMENTAL ANALYSIS OF THE PROBLEM, by Robert Plutchik. Rept. on Contract Nonr-2252(01). Oct 57, 72p. 80 refs.
Order from LC mi$4.50, ph$12.30 PB 137 345

A critical review of the more recent literature (mainly since 1950) has been prepared showing the influence of loud and/or repetitive sounds on behavior, feeling and physiology.

Istituto Nazionale di Ottica (Italy).
BASIC RESEARCH IN THE FIELD OF VISION. Final rept. on Contract AF 61(052)17. Nov 58, 23p. 25 refs. AFOSR TR-59-14; AD-210 473.
Order from LC mi$2.40, ph$4.80 PB 139 642

The research has been to investigate some specific effects of contrast and of interaction which arise due to a variation of the light stimulus with time. The program has been divided into three parts. The first to extend some previous investigations made by other researchers on the role of eye movements in vision. Part II is a research on the mutual interaction of the two eyes. Part III is an investigation about the influence of the time variation of the luminance on fusion conditions and on electroretinal response. The results obtained suggest some practical applications.

Johns Hopkins Hospital, Baltimore, Md.
FACTORS AFFECTING THE PULMONARY DEAD SPACE AS DETERMINED BY SINGLE BREATH ANALYSIS, by Richard H. Shepard, E. J. Campbell, and Harry B. Martin. Dec 58, 6p. 5 refs. AFSAM-58-138.
Order from LC mi$1.80, ph$1.80 PB 139 538

The pulmonary dead space was measured in a normal subject by the single-breath method of Fowler, using continuous simultaneous recordings of expired volume and CO_2 concentration. Experimental data included, for each dead space measurement, the end-inspiratory values of lung volume and intra-esophageal pressure, tidal volume, and time of breath holding. Dead space (V_D) increased with increasing end-inspiratory lung volume (V_L). It did not change significantly with tidal volume unless V_L was allowed to change. The relationship between V_D and V_L was not linear (for example, V_D = 130 ml. at V_L = 3.2 liters, 190 ml. at 6.0 liters, and 245 ml. at 7.7 liters). The relationship between V_D and the esophageal-mouth pressure differences ($P_E - P_M$) was very nearly linear ($V_D = 120 - 3.46 (P_E - P_M)$; S.D., 10 ml.). The volume distensibility of the total dead space was only a little less, on a percentage basis, than that of the alveoli. Since V_D becomes essentially the same for all lung volumes after 20 seconds of breath-holding, it seems likely that most of the distensibility of the dead space resides in the small conducting airways. If this is true, the percentage volume distensibility of these airways must be nearly equal to that of the alveoli.

Johns Hopkins U. [Baltimore, Md.]
PHYSICAL BASIS OF CARDIOVASCULAR SOUND: AN ANALYTICAL SURVEY, by H. K. Wiskind and S. A. Talbot. Final rept. on Mechanisms of Sound Generation in Fluid Flow as Related to Cardiovascular Structures, Contract AF 18(600)1337. Dec 58, 121p. 63 refs. AFOSR TR-58-160; AD-207 459.
Order from LC mi$6.30, ph$19.80 PB 140 955

In the introductory chapter a review of the published work on this subject by medical researchers is given. An account of simple observations of the sounds of a cavitating water jet and of an underwater vortical sound generator is given. Detailed analyses of vibrations in the human anatomy are presented. Three idealized models were investigated: (1) Monopole radiation in a model of the heart and chest having spherical symmetry (2) Axisymmetric waves at acoustic frequencies in the blood-aorta system. (3) General properties of extended tissue as an extended acoustic medium. Related literature is reviewed and criticized in the discussion. The development work on two types of instruments designed to measure the dynamic dilations of compliant tubes is described. An Appendix presents the derivation of the "steady state" wave speed relation for finite waves in systems of elastic tubes containing compressible fluid.

Johns Hopkins Hospital, Baltimore, Md.
THE RELATIONSHIP BETWEEN CARDIAC OUTPUT AND THE APPARENT DIFFUSING CAPACITY OF THE LUNG IN NORMAL MEN DURING TREADMILL EXERCISE, by Richard H. Shepard, E. Varnauskas, and others. Jan 59, 14p. 16 refs. AFSAM rept. 58-137
Order from LC mi$2.40, ph$3.30 PB 140 935

Two methods for estimating pulmonary diffusing capacity (steady-state O_2 method of Lilienthal and Riley and steady-state CO method of Filley) were compared by applying them simultaneously in three normal young men at different levels of treadmill exercise with and without hypoxia. Cardiac output (indicator dilution) was estimated at the same time. Subjects were studied at each of four levels of exercise producing oxygen uptakes between 1 and 2 1/2 liters per minute and cardiac outputs between 9 and 22 liters per minute. Diffusing capacity for CO increased progressively with increasing exercise in all subjects. It was higher during hypoxia than during air breathing at the same level of exercise, as were total ventilation, tidal volume, and cardiac output. This increase in DCO cannot be explained solely on the basis of increased affinity of hemoglobin for CO during hypoxia. Diffusing capacity for oxygen increased progressively until the cardiac output reached about 15 liters per minute but did not increase significantly with further increase in cardiac output. The reasons for the difference in the shape of the curve of diffusing capacity vs. cardiac output in the case of CO as opposed to O_2 remain obscure but are believed to be related primarily to differences in the weighting of the many factors involved.

Mount Zion Hospital, San Francisco, Calif.
STUDIES OF THE REGIONAL DISTRIBUTION OF BLOOD FLOW VOLUME. I. CEPHALIC MEASUREMENTS, by A. E. Lewis. Final rept. on Contract AF 18(600)1338. 10 Dec 57, 13p. AFOSR TR-58-1; AD-148 035.
Order from LC mi$2.40, ph$3.30 PB 140 870

All of the studies thus far suggest that this problem is insoluble. Present investigations are continuing in two ways: (1) we are hoping to find an easily measurable indicator that is excreted some three to four times as fast as bromsulfslein, and (2) we are studying the possible parameters which account for the inequality described in the first study. Under the first category we are considering the possibility of using diodrast as an indicator. At the present time this indicator is difficult to measure with the desired accuracy, and the form tagged with I^{131} is prohibitively expensive. In any event, it would be premature to completely discard the double indicator method until all possibilities have been excluded.

Naval Research Lab., Washington, D. C.
SOME CHARACTERISTICS OF THE EYE AFFECTING PHOTOMETRIC MEASUREMENTS, by L. J. Boardman. Interim rept. 13 May 59, 21p. 6 refs. NRL rept. 5296.
Order from LC mi$2.70, ph$4.80 PB 138 796

The visual sensitivity across the temporal side of the retina relative to that at the fovea has been measured by five observers using a luminance level that is low in the mesopic region. The observers reported nearly the same variations out to 30 degrees from the fovea but wide differences beyond this region. A test of one observer's sensitivity to various colors on both the temporal and nasal sides of the retina showed much the same increase on both sides. The effect on visual measurements of equivalent luminance by changing the size, shape, and color of the photometric field at five different levels in the mesopic region was investigated by five observers. The results obtained are explained by a study of the sensitivity variations.

St. Louis U. School of Medicine, Mo.
REGULATION OF BODY TEMPERATURE DURING CONTINUOUS EXPOSURE TO HEAT, by I. D. Ferguson and A. B. Hertzman. Rept. on Human Thermal Tolerance, Contract AF 18(600)3357. July 58, 20p. 5 refs. WADC Technical rept. 57-727; AD-155 781.
Order from LC mi$2.40, ph$3.30 PB 140 908

Three lean healthy resting nude young men were exposed twice to dry and wet bulb temperatures of 43.3° and 30.3°C for 32 hours. Body weight was maintained by food and water. Physiological regulation of body temperature was continuously successful as indexed (after initial thermal equilibration of the subject with the chamber) by essentially constant skin and oral temperatures, rates of water loss, and unweighted averages of regional sweating rates. Fatigue of the subject did not show in rates of total evaporation or in body temperatures. Forehead sweating rates tended to increase. Small diurnal variations seemed to appear in several of the regional sweating rates but may not have been statistically significant. The regional sweating pattern characteristic of the particular subject at T_A of 43.3°C was exhibited continuously during the entire exposure and in the repeat experiment. The mean rates of urine formation in the six experiments showed an inverse relation with the mean oral temperatures.

School of Aviation Medicine, Randolph AFB, Tex.
CENTRAL REPOSITORY FOR HEARING CONSERVATION DATA: AN EXAMINATION OF THE FIRST YEAR'S REPORTING, by Daryle L. Waldron. Oct 58, 21p. Aeromedical Reviews no. 3-59.
Order from LC mi$2.70, ph$4.80 PB 139 577

This report is an attempt to summarize and share some of the information gained from the first year's experience in handling and examining the Forms 1490, and in communicating with those persons responsible for their completion.

Syracuse U. Research Inst., N. Y.
CYBERNETIC ASPECTS OF HOMEOSTASIS, by Stanford Goldman. Technical rept. no. 1 on Contract Nonr-669(10). 8 Jan 58, 71p. 16 refs. Rept. no. EE494-581T1.
Order from OTS $2.00 PB 151 733

"Cybernetics" is used to describe the entire field of control and communication theory, whether in the machine or in the animal. The word is derived from a Greek word meaning "steersman." In the present article we develop ab initio the principles of feedback and servo theory, and also of information theory, and shall try to see what light they can throw on the study of homeostasis.

Army Chemical Warfare Labs., Army Chemical Center, Md.
DETERMINATION OF BLOOD CHOLINESTERASE LEVELS BY THE SELF-EQUILIBRATING CONSTANT pH ELECTROTITRATOR AND BY DIFFERENTIAL pH MEASUREMENTS, by Ethel B. Hackley and James S. Strong. Oct 58, 10p. 5 refs. CWLR-2255.
Order from LC mi$1.80, ph$1.80 PB 139 536

Levels of red blood cell cholinesterase in normal uninhibited blood samples were determined by two methods (self-equilibrating constant pH and differential pH). Enzyme activity data by both methods were required for their comparative evaluation, per se, and their use in connection with decisions in poisoning with CW agents. Twelve human subjects were used for controls and comparative purposes. Analyses of the blood samples were performed at periodic intervals from the day of collection to the eighth day after. It was found that the two methods had a relatively high coefficient of correlation (r = 0.86). However, while the two methods may be comparable for blood and tissue samples from other animal species, it should be noted that the correlation obtained in this study was for normal human red blood cells.

Clayton Foundation Biochemical Inst., U. of Texas, Austin.
WHOLE-BODY LIPID METABOLISM OF RATS AFTER CHRONIC EXPOSURE TO ADVERSE ENVIRONMENTS, by Roy B. Mefferd, Jr., M. A. Nyman (Southwest Foundation for Research and Education) and W. W. Webster (U. of California). Dec 58, 5p. 18 refs. AFSAM rept. 58-116.
Order from LC mi$1.80, ph$1.80 PB 139 578

The specific activities of the total nonsaponifiable lipids, cholesterol, total fatty acids, solid fatty acids, and liquid fatty acids, and the liver succinic dehydrogenase activities were determined for adult male Sherman strain rats following chronic exposure (2 months) to cold (2°C.), neutral (24°C.), or hot (35°C.) temperatures or to discontinuous (4 hours daily) simulated altitude (18,000 feet, 24°C.). By all indices lipid metabolism was elevated in the cold, and by most it was depressed in the heat and altitude. In the latter, however, succinic dehydrogenase activity was elevated. Cholesterol, liquid fatty acids, succinic dehydrogenase activity, and the cholesterol/total nonsaponifiable lipid ratios decreased linearly with temperature. The solid/liquid fatty acids ratio was elevated in the heat. The solid fatty acid/cholesterol ratio was temperature independent, but was depressed in the altitude group.

Columbia U., New York.
STRUCTURE AND ANTIBIOTIC ACTIVITY OF PEPTIDES, by Bernard F. Erlanger. Annual progress rept. for 1 Nov 56-31 Oct 57 on Contract Nonr-266(44). 9 Dec 57, 5p. 5 refs.
Order from LC mi$1.80, ph$1.80 PB 137 314

The research program consists of two parts: (a) the continuation of the synthesis of peptides related to gramidicin S; (b) the initiation of a study of the interaction of enzymes with "insoluble substrates." Both aspects are discussed.

Northwestern U. Medical School, Chicago, Ill.
PURIFICATION OF ERYTHROPOIETIN BY ION-EXCHANGE CHROMATOGRAPHY, by W. A. Rambach, J. A. D. Cooper, and H. L. Alt. Dec 58, 6p. 10 refs. AFSAM-59-14.
Order from LC mi$1.80, ph$1.80 PB 139 539

A method is given for the purification of erythropoietin from the filtrate of acidified, boiled plasma prepared from phenylhydrazine anemic rabbits utilizing DEAE-cellulose ion-exchange columns. The active erythropoietic factor thus prepared has been partially characterized and shown to be an acidic glycoprotein of low molecular weight.

School of Aviation Medicine, Randolph AFB, Tex.
ENZYME ACTIVITY IN THE SERUM AND COMMON DUCT BILE OF DOGS, by Harold D. Frankl and James H. Merritt. Dec 58, 5p. 13 refs. Rept. 59-19.
Order from LC mi$1.80, ph$1.80 PB 139 568

The observations that patients with obstructive jaundice show elevated levels of serum glutamic oxalacetic transaminase and that ligation of the common bile duct in rats results in similar enzyme changes prompted direct investigation of the excretory pathway of the serum enzyme-protein moieties. Mongrel dogs, subjected to cholecystectomy and ligation of the common bile duct, were used. Exposure of these animals to carbon tetrachloride vapor, with the expected massive increase in serum glutamic oxalacetic transaminase, failed to result in increased bile levels of the enzyme. Correspondingly, when pure enzyme was administered intravenously to these animals increased serum activity levels failed to induce a corresponding elevated bile activity. These data indicate that if the bile serves as an excretory pathway for serum enzymes, such pathway is minor.

Texas U. Medical Branch, Galveston.
A METHOD FOR STUDYING CHANGES IN PROFIBRINOLYSIN TITER IN DOGS FOLLOWING IN VIVO INDUCTION OF FIBRINOLYTIC ACTIVITY, by D. R. Celander and M. Mason Guest. Jan 59, 11p. 37 refs. AFSAM rept. 59-27.
Order from LC mi$2.40, ph$3.30 PB 139 569

A two-stage assay for canine profibrinolysin (plasminogen) is described. This assay is suitable for following in vivo changes in profibrinolysin titer induced by various experimental procedures. Plasma profibrinolysin is concentrated by a low ionic strength, protamine sulfate precipitation technic and activated with staphylokinase. Diluted aliquots of the activated solution are then assayed for fibrinolytic activity. One unit is that amount of activity which at 37° C. and pH 7.25 will bring about lysis of 0.4 ml. of a 0.1 percent bovine fibrin clot in 300 seconds. The average dog plasma contains 19.4 units per milliliter. In general, increases in circulating fibrinolytic activity are associated with decreases in profibrinolysin.

Armed Services Technical Information Agency, Arlington, Va.
BIO-ASTRONAUTICS: AN ASTIA REPORT BIBLIOGRAPHY. Feb 59, 163p. 905 refs. AD-211 775.
Order from OTS $3.00 PB 151 853

Literature coverage of the present bibliography is generally from 1952 to 1958. This bibliography is a reproduction of catalog cards in the AD files of ASTIA. It comprises a selected list of references to reports relating to the biological problems of space flight. The entries are grouped under ASTIA subject headings.

School of Aviation Medicine, Randolph AFB, Tex.
IMPROVED PHONETICS IN ARTIFICIAL DENTURE CONSTRUCTION, by Leslie R. Allen. Dec 58, 12p. 30 refs. Rept. no. 59-10.
Order from LC mi$2.40, ph$3.30 PB 139 548

The literature in dental prosthetics was reviewed, and previous methods for improving phonetics were evaluated. The literature in phonetics was perused, with special attention given to tongue positions in phonation. The tongue plays a major role in speech. It changes position and shape for the pronunciation of each of the vowels, and it is the principal articulator for the consonants. Palatograms were made on a group of dentulous individuals with normal speech, who were chosen so as to incorporate a maximum variety of tooth arrangement, tooth occlusion, arch form, arch size, vault form, and vault depth.

Microbiology

Institute for Cancer Research, Philadelphia, Pa.
PROTEIN SYNTHESIS AND DEGRADATION IN LIVING BACTERIA, by Gerrit Toennies and Gerald D. Shockman. Final rept. for 1 Apr 51-31 Aug 57 on Contract Nonr-244(00). 30 Nov 57, 4p. 13 refs.
Order from LC mi$1.80, ph$1.80 PB 137 113

An index of all technical reports and of all publications issued under the contract.

Kentucky Research Foundation [Lexington].
RAPID BIOCHEMICAL TECHNIQUES FOR THE IDENTIFICATION OF MICROORGANISMS, by R. H. Weaver. Final rept. on Contract DA 18-064-404-cml-164. 30 June 57, 14p.
Order from LC mi$2.40, ph$3.30 PB 139 504

This report states useful techniques developed and briefly reviews results that have been obtained.

Aero Medical Lab., Wright Air Development Center, Wright-Patterson, AFB, Ohio.
BENDS AND DENITROGENATION IN HIGH-ALTITUDE FLIGHT OPERATIONS, by R. H. Middleton. Rept. on Special Physiological Measurements. Mar 59, 13p. 5 refs. WADC Technical rept. 58-625; AD-212 561.
Order from OTS $0.50 PB 151 833

Ascent to altitudes above 25,000 feet is accompanied frequently by symptoms of decompression sickness. The only consistently effective prophylaxis known to date is the lowering of the level of dissolved body nitrogen by breathing undiluted oxygen. Past experimental evidence is reviewed and presented with results of more recent investigations and incidental observations in conjunction with simulated ascents to high altitudes. Prebreathing undiluted oxygen for 2 hours will reduce the incidence of severe symptoms of decompression sickness to an operationally insignificant level when the mission includes the possibility of exposure for 30 minutes or longer to cabin altitudes above 35,000 feet. Shorter denitrogenation time offers adequate protection for lower altitudes or exposures of shorter duration. The relative efficiency of ground-level versus in-flight denitrogenation is discussed.

Army Chemical Warfare Labs., Army Chemical Center, Md.
COMPARISON OF BALLISTIC DATA TO ELECTROLYTE CHANGES IN BALLISTICALLY WOUNDED MUSCLE, by Robert R. Ingram, Jr., Charles E. Fields, and Ross O. Kines. Dec 58, 79p. 6 refs. CWLR-2265.
Order from LC mi$4.50, ph$12.30 PB 139 664

A new method of estimating the relative tissue damage produced by different missiles at various velocities was developed.

Army Chemical Warfare Labs., Army Chemical Center, Md.
THE MEDICAL RESEARCH VOLUNTEER PROGRAM. June 58, 16p. 4 refs. CWL Special Pub. 2-13.
Order from LC mi$2.40, ph$3.30 PB 139 546

Connecticut Coll., New London.
EVALUATION OF COLOR VISION TESTS, by Jane W. Torrey. Annual summary rept. of progress on Contract Nonr-996(03). Nov 57, 5p. 3 refs. AD-148 299.
Order from LC mi$1.80, ph$1.80 PB 137 137

The survey of color defect in women was continued. No new data were obtained. The threshold of color defectives was measured by an adjustment method. A comparison of 2 different color discriminations in normals suggested a 3-component theory concerning blue and yellow.

Harvard Medical School, Boston, Mass.
IMPROVEMENT OF THE THERAPY OF TRAUMA AND SURGICAL DISEASE THROUGH STUDY OF ITS CELLULAR AND METABOLIC EFFECTS, by Oliver Cope. Final rept. on Intracellular changes in Trauma, Depletion and Repair, Contracts N5ori-076(13) and Nonr-1866(23). 25 Nov 57, 10p. 40 refs.
Order from LC mi$1.80, ph$1.80 PB 137 121

A summary of the results. Giving the scope and details of the investigations worthy of publication

School of Aviation Medicine, Randolph AFB, Tex.
CARDIAC ARRHYTHMIAS IN EXPERIMENTAL SYNCOPE, by George Dermksian and Lawrence E. Lamb. Nov 58, 18p. 5 refs. Rept. 59-16.
Order from LC mi$2.40, ph$3.30 PB 139 570

Fifty young, apparently healthy aviation cadets in preflight training were evaluated with regard to syncope. Thirty percent of these subjects admitted that they had experienced previous, undisclosed syncope, when they were not in fear of detection or removal from the training program. Twenty-one of the cadets experienced experimental syncope during the syncope procedures. Cardiac arrhythmia was frequently associated with the syncopal episode and cardiac arrhythmia was frequently induced by respiratory maneuvers without syncope. Intravenous administration of atropine apparently prevented recurrence of cardiac arrhythmia induced by respiratory maneuvers. Significant cardiac arrhythmia was also noted in simple orthostatic syncope.

School of Aviation Medicine, Randolph AFB, Tex.
A COMPARATIVE EVALUATION OF TISSUE TOLERANCE TO A GALLIUM ALLOY, by Jack L. Hartley and Norman O. Harris. Nov 58, 10p. 16 refs. Rept. 58-148.
Order from LC mi$1.80, ph$1.80 PB 139 567

The reaction of the abdominal subcutaneous tissues of guinea pigs to disk implants of various dental filling materials, including a gallium alloy, was used for toxicity bio-assay. Histopathologic and clinical evidence indicated that a self-curing resin material was innocuous. Amalgam, silicate, crown and bridge cement, and copper cement, were, in the order of listing, progressively irritating to the tissues of the guinea pig. The gallium alloy consistently produced the most severe reaction, a caseation necrosis being pathognomonic.

School of Aviation Medicine, Randolph AFB, Tex.
NEW INSTRUMENTATION FOR THE QUANTITATION OF AGAR PRECIPITIN COLUMNS, by William G. Glenn. Nov 58, 4p. 5 refs. Rept. no. 58-133.
Order from LC mi$1.80, ph$1.80 PB 139 481

A new instrumentation for direct photometry of antigen-antibody reactions in agar columns is described. It combines a custom-made scanner and commercially available recorder. These incorporate the better features of two previous instruments developed for laboratory use. The flexibility and sensitivity of the Serum Agar Scanner Instrumentation (SASI) enable the instrument to graphically characterize diffusing precipitin systems in an efficient manner.

Army Chemical Warfare Labs., Army Chemical Center, Md.
THE EFFECTS OF SOME "PSYCHOGENIC" AGENTS ON SWIMMING TIME IN GUINEA PIGS, by Charles G. Wilber. Nov 58, 8p. 3refs. CWLR-2262.
Order from LC mi$1.80, ph$1.80 PB 139 537

The swimming of guinea pig to exhaustion in a water bath was used to evaluate the incapacitating effects of EA 1542, lysergic acid diethylamide (LSD), bufotenine, yohimbine, and meprobamate. Guinea pigs treated with LSD swam for significantly shorter periods of time than did untreated. Meprobamate in doses of 25 mg. /kg. decreased swimming time by one-third. Bufotenine in doses as high as 5 mg. /kg. caused no change in swimming time. Although doses of EA 1542 between 30 and 50 mg. /kg. were followed by suppression of the righting reflex in guinea pigs, no decrease in swimming time resulted. Yohimbine at a dose of 2 mg. /kg. brought about a significant decrease in swimming time. The doses which would reduce swimming time to 50 per cent of control (the ST 50) for two drugs are as follows: meprobamate, 45 mg. /kg., and yohimbine, 3.5 mg. /kg. Yohimbine and LSD are the only drugs tested which have an incapacitating effect (as measured by the swim test) in reasonably small doses. LSD is more potent in this respect than yohimbine.

Army Chemical Warfare Labs., Army Chemical Center, Md.
PHARMACOLOGY OF ANTICHOLINESTERASES, by J. H. Wills. Oct 58, 55p. 103 refs. CWL Special Pub. 2-14.
Order from LC mi$3.60, ph$9.30 PB 139 547

This paper is intended to be a survey, rather than an exhaustive review, of present knowledge on the pharmacology of the cholinesterase-inhibiting phosphorus derivatives. It attempts to furnish examples of the most important points of knowledge and to furnish references to lead the reader to other sources of information in this field.

Army Chemical Warfare Labs., Army Chemical Center, Md.
RELATIVE EFFICACY OF VARIOUS PROPHYLACTIC ADJUNCTS TO ATROPINE IN SARIN POISONING, by John F. O'Leary, J. H. Wills, and L. A. Carlstrom Jan 59, 9p. 19 refs. CWLR-2267.
Order from LC mi$1.80, ph$1.80 PB 139 665

In experiments to ascertain the relative effectiveness of a variety of pharmacologic types of agents as adjuncts to atropine, compounds promoting the rapid regeneration of cholinesterase were superior to other types of agents in the treatment of poisoning by anticholinesterases. Three of the compounds tested were oximes possessing this type of action: 1,1'- trimethylene bis (4-formylpyridinium bromide oxime) (EA 1814, TMB-4), pyridine-2-aldoxime methiodide (2-PAM), and 2, 3-butanedione 2-oxime (DAM). Of the three, EA 1814 was the best. However, due to differences in slopes of GB dose-mortality curves, EA 1814 did not exceed 2-PAM in effectiveness at the lower levels of GB dosage.

Army Chemical Warfare Labs., Army Chemical Center, Md.
STUDIES ON THE STRUCTURE OF CLAM POISON. PART I, by Leon Mandell and E. A. Metcalf. Rept. for 1 July 54-30 June 55. Nov 58, 36p. 6 refs. CWL Special Pub. 1-2.
Order from LC mi$3.00, ph$6.30 PB 139 545

The work described was to evaluate all previous structural work on the poison, to devise and carry out appropriate small scale (mg. or less) chemical degradations on this poison and to interpret the results of these reactions in terms of the structure.

Army Chemical Warfare Labs., Army Chemical Center, Md.
TRANSACTIONS OF THE SYMPOSIUM ON HEALTH HAZARDS OF MILITARY CHEMICALS HELD AT ARMY CHEMICAL CENTER, MD., ON 13-14 JANUARY 1958, by Keith H. Jacobson. Aug 58, 112p. 41 refs. CWL Special pub. 2-10.
Order from LC mi$6.00, ph$18.30 PB 140 914

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Medical Coll. of Virginia, Richmond.
PHYSIOLOGICAL AND PHARMACOLOGICAL ACTIONS OF HYDRAZINE, METHYLHYDRAZINE, 1,1-DIMETHYLHYDRAZINE, AND 1,2-DIMETHYLHYDRAZINE. Rept. on Contract DA 18-108-cml-208. Jan 55, 25p. MLCR no. 52.
Order from LC mi$2.70, ph$4.80 PB 140 831

As far as practicable the discussion will follow the outline presented below, the actions of hydrazine being presented first: (1) chronic toxicity by ingestion; (2) chronic toxicity by inhalation; (3) acute toxicity; (4) metabolism and elimination; (5) convulsant action; (6) effects on respiration; (7) effects on gastro-intestinal tract; (8) effects on blood pressure; (9) effects on blood sugar; (10) effects on blood volume; (11) urine excretion; and (12) treatment.

Radiobiology

Army Medical Research and Nutrition Lab., Denver, Colo.
THE EFFECT OF DIETARY SUPPLEMENTS ON THE RADIOSENSITIVITY OF THE RAT, PARTS I II, by Zigmund Z. Ziporin, Jerry Ann Tillotson and others. 22 Jan 59, 17p. 6 refs. Rept. no. 230.
Order from LC mi$240, ph$3.30 PB 140 833

There were no significant differences in the weight gains of rats receiving 725r of total body radiation when compared with unirradiated controls pair-fed with the same streptomycin-containing synthetic diet. Dietary supplements of liver extract or of whole liver had the same effects on the weight change of irradiated and control rats. The survival of rats receiving 750r of total body radiation was slightly greater, but not significantly so on a laboratory chow diet than on a synthetic diet, but dietary supplements had no apparent effects.

Army Medical Research Lab., Fort Knox, Ky.
EFFECTS OF X-RAYS ON PREFORMED ANTIBODIES, by A. J. Luzzio and V. Evangelinos. Rept. on Biological and Medical Aspects of Ionizing Radium. 28 Oct 58, 10p. 10 refs. Rept. no. 369.
Order from LC mi$1.80, ph$1.80 PB 139 505

Exposure of bacterial agglutinins, in immune sera, to various doses of X-rays resulted in the inactivation of specific immunologic combining sites. Other sites in the same sera remained relatively stable at the same dose levels. The results reported indicate antibodies possess specific radiosensitivities and may be removed selectively from a polyvalent serum. The evidence presented suggests that denaturation of antibody protein by ionizing radiation proceeds in an orderly sequence.

Army Medical Research Lab., Fort Knox, Ky.
INFLUENCE OF CYSTEINE ON THE INTESTINAL EPITHELIUM OF X-IRRADIATED RATS, by R. P. Beliles, J. G. Kereiakes, and A. T. Krebs. Rept. on Biological and Medical Aspects of Ionizing Radiation. 27 Oct 58, 21p. 30 refs. Rept. no. 368.
Order from LC mi$2.70, ph$4.80 PB 139 506

Cysteine affords protection against X-ray induced mitotic inhibition of the epithelium cells of the small intestine in rats given 100 r and 300 r whole body irradiation. For the 300 r dose level, the rate of recovery of the mitotic activity was about the same for both non-treated and cysteine-pretreated groups. The time of depression of mitotic activity varied with radiation dose. A disappearance of crypt structure in the higher dose range, 1000 r and 3000 r, was noted. The protective effect of cysteine on crypt structure was reflected by increased survival at 1000 r and increased survival time at 3000 r.

Biophysics Lab., Tulane U., New Orleans, La.
INVESTIGATION OF THE BIOLOGICAL EFFECTS OF MICROWAVE IRRADIATION, by Robert T. Nieset, Rene Baus, Jr. and others. Annual progress rept. for 11 June-15 Nov 57 on Contract Nonr-475(03). [1957] 23p.
Order from LC mi$2.70, ph$4.80 PB 137 143

The work has been principally concerned with the verification and extension of earlier studies regarding rate of growth changes and plasma volume alterations. Two things have been accomplished. First, the values of growth rate alteration have been verified for both chronic and acute dosages. Secondly, the alterations of plasma volume resulting from both low and high intensity exposures have been characterized by statistically significant data. A preliminary analysis of these data indicates that there exists a quantitative correlation between the alteration of tissue plasma volumes and the change of body weight resulting from exposure to acute high intensity microwave doses.

Material Lab., New York Naval Shipyard, Brooklyn.
RESEARCH REPORT ON BURNS TO WHITE RAT SKIN FOR NUCLEAR WEAPON PULSES OF INTENSE THERMAL RADIATION, by Willard L. Derksen. Guy P. de Lhery and others. Final rept. 4 Apr 58, 22p. 19 refs. Lab. Project 5046-16, pt. 2; AFSWP-1070.
Order from LC mi$2.70, ph$4.80 PB 139 491

In these studies bare rat skin has been irradiated for control purposes and for correlating the data obtained with results of similar studies in other laboratories. The thermal radiation source employed in these studies was a modified carbon-arc searchlight, employing a shutter to simulate nuclear weapon pulses of thermal radiation. The radiant exposures to produce eschar (scab) burns requiring extensive healing of the depilated rat skin were determined to be 5.7, 5.6, 6.0, and 7.5 cal/cm^2 for thermal radiation pulses corresponding to nuclear detonations of 40, 250, 1000, and 10,000 kilotons.

CHEMISTRY

Pennsylvania U., Philadelphia.
CHEMISTRY OF THE LIGHTER ELEMENTS, by E. Charles Evers, A. MacDiarmid and others. Annual progress rept. no. 2, 1 Feb 57-1 Jan 58, on Contract Nonr-551(21). 105p.
Order from OTS $2.50 PB 151 534

The interaction of diborane or boron halides with silylcyanide or trimethylsilylcyanide has led to a new class of compounds having the general formula BX_2CN, where X is hydrogen or a halogen. A number of methods have been studied to effect the preparation of compounds bearing the P-Si bond. Di-n-butyl-, di-n-propyl- and diethylborinophosphine have been prepared. As prepared, these substances exist as low molecular weight polymers. This study is continuing. When siloxane is treated with aluminum halides the Si-O bond is cleaved, silylhalide is eliminated and polymeric siloxyaluminum halides presumably are formed. Of especial interest is the result obtained when two valences in aluminum are blocked by methyl groups. A number of syntheses are suggested here which will be followed up. A number of miscellaneous exploratory studies are in progress.

Analytical Chemistry

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE DETERMINATION OF DISTRIBUTION COEFFICIENTS IN ZONE-REFINED SILICON USING RADIOACTIVE ISOTOPES: A FEASIBILITY STUDY, by Robert L. Fish. Master's thesis. Mar 59, 85p. 22 refs. GNE-59-8.
Order from LC mi$4.80, ph$13.80 PB 140 731

Two principles of zone melting are discussed in connection with distribution coefficients. Two methods of using radioactive gold to determine the distribution coefficient of gold in silicon are discussed. The effects of 29 other impurity elements in silicon are analyzed.

Callery Chemical Co., Pa.
STANDARD X-RAY DIFFRACTION POWDER PATTERNS, by P. I. Henderson, H. G. Norment and H. J. Birch. Rept. on Project Zip, Contract NOas-58-454-d. 15 Aug 58, 66p. 2 refs. Rept. no. CCC-454-TR-294.
Order from LC mi$3.90, ph$10.80 PB 139 475

Thirty-nine standard X-ray diffraction powder patterns, for the most part of boron compounds, are collected in this report. Qualitative intensity data are given for most of the patterns. Where possible, quantitative intensity data for these patterns will be included in subsequent reports.

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
TEST METHODS FOR ALKALINE CLEANER FOR CONDITIONING TREATMENT FOR ACID CLEANED COOLING SYSTEMS, by R. E. Wagner. 18 Feb 58, 9p. 3 refs. Rept. no. CCL #72.
Order from OTS $0.50 PB 151 727

Test methods were necessary to enable procurement of the alkaline cleaner of the newly developed conditioning treatment for acid cleaned cooling systems. This treatment is intended for use in conjunction with Military specification MIL-C-10597B. Modification of standard analytical methods were made as needed to enable separation of the phosphate, borax and carbonates involved. Mixtures of the three components of the rinse mixture have been analyzed within 0.2% accuracy by these methods. Various ratios of components were used in the study. It is recommended that the test methods developed be included in the procurement specification when written.

Metal Hydrides, Inc., Beverly, Mass.
RESEARCH CONSISTING OF SPECTROGRAPHIC ANALYSIS OF SAMPLES AND DEVELOPMENT OF SPECTROGRAPHIC METHODS FOR THE DETERMINATION OF IMPURITIES IN PURE SILICON, by James M. Morris. Final rept. on Contract AF 19(604)1416. 1 Apr 58, 5p. AFCRC TR-58-174; AD-160 811.
Order from LC mi$1.80, ph$1.80 PB 137 152

This report is a brief summary of the contract objectives and the work performance. The spectrographic research was concentrated in the first year and has been described previously. The supplemental agreements which extended the contract period were primarily for analytical services. (See also PB 123 910)

Naval Ordnance Test Station, China Lake, Calif.
MICRO DETERMINATION OF CARBON AND HYDROGEN IN ORGANIC COMPOUNDS, by E. M. Bens. 8 Jan 58 [31]p. 31 refs. NOTS-1891; NAVORD Rept. 5812; AD-151 996.
Order from OTS $1.00 PB 151 570

A method for the determination of carbon and hydrogen in organic materials that is of particular interest to propellant chemists has been developed. The method employed embodies changes in accepted procedures necessary to properly evaluate new compounds of extremely high- or low-nitrogen content.

Necessary changes include the combination of several combustion tube packings, the removal of an external heat source about the Anhydrone tube, and the use of a larger hydroxylamine phosphate trap for the removal of nitrogen oxides.

Naval Ordnance Test Station, China Lake, Calif.
OXIDATION OF 1,1-DIALKYLHYDRAZINES: CHROMATOGRAPHIC SEPARATION AND ULTRAVIOLET ANALYSIS OF SOME TETRAALKYLTETRAZENES, by Everett M. Bens and William R. McBride. 19 June 58, 39p. 12 refs. NOTS-2016; NAVORD-5879.
Order from LC mi$3.00, ph$6.30 PB 140 887

A method for the gas-liquid chromatographic separation of mixtures of tetraalkyltetrazenes at 70°C on a column containing polyethylene glycol as the stationary phase is described. The effluent distribution and resolution of several tetraalkyltetrazenes is determined by ultraviolet absorption analysis in both absolute ethanol and basic aqueous solution. Factors affecting the quantitative aspects of the chromatographic separation and recovery of the tetraalkyltetrazenes are considered in detail.

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
DETERMINATION OF OXYGEN IN BISMUTH AND OTHER METALS, by Earl S. Funston and S. A. Reed. 3 Aug 49, 8p. NEPA 1097-SCR-51; ATI-188 825.
Order from LC mi$1.80, ph$1.80 PB 137 030

A method is presented for quantitatively measuring traces of oxygen in bismuth, arsenic and other metals whose oxides are reduced by hydrogen in the temperature range 200-900°C. An indirect determination is made by measuring the volume loss of hydrogen after reduction of the metal oxides in a closed system. (Amounts of oxygen from 2-500 ppm can be readily determined with an absolute error of ± 1 per cent).

Virginia U., Charlottesville.
THE DETERMINATION OF STEROID ALCOHOLS WITH ACETIC ANHYDRIDE C^{14}, by Vincent P. Hollander and Julia Vinecour. Dec 58, 7p. 8 refs. AFSAM rept. 58-33.
Order from LC mi$1.80, ph$1.80 PB 139 562

The preparation of acetic anhydride-C^{14} of two levels of specific activity is described. The preparation of derivatives of alcoholic steroids enabled submicrogram analysis of pure androsterone, dehydroepiandrosterone, cortisone, and corticosterone. Excess acetic anhydride can be recovered from reaction mixtures. This materially decreases the cost of the analysis. Mixtures of these compounds were acetylated and measured. Hydrocortisone and corticosterone were recovered from plasma. Androsterone and dehydroepiandrosterone were added to plasma from which free steroids had been extracted. Recovery of these steroids failed following acid hydrolysis of the plasma due to gross contaimination with an unidentified radioactive impurity. The acetic anhydride C-14 procedure is capable of submicrogram analysis of alcoholic steroids in cases where radiopurity of the derivative can be obtained.

Colorado U., Boulder.
BRIDGED POLYCYCLIC COMPOUNDS. VI. THE PHOTOISOMERIZATION OF BICYCLO(2,2,1) HEPTA-2,5-DIENE-2,3-DICARBOXYLIC ACID TO QUADRICYCLO($2,2,1,0^{2,6},0^{3,5}$) HEPTANE-2,3-DICARBOXYLIC ACID, by Stanley J. Cristol and Robert L. Snell. Rept. on Contract N6onr-231(03). [1957] 12p. 18 refs.
Order from LC mi$2.40, ph$3.30 PB 137 120

The synthesis of quadricyclo($2,2,1,0^{2,6},0^{3,5}$) heptane-2,3-dicarboxylic acid by irradiation of bicyclo(2,2,1)hepta-2,5-diene-2,3-dicarboxylic acid is described. This represents the first compound reported with this ring system.

Columbia U. [New York]
LIQUID PHASE REACTIONS UNDER VERY HIGH PRESSURES, by Cheeves Walling. Final rept. for 1 Sep 54-31 Aug 56 on Contract Nonr-266(30). 18 Apr 58, 24p. 20 refs. CU-8-58-ONR-266(30)-Chem.
Order from LC mi$2.70, ph$4.80 PB 139 593

The dimerization of isoprene is strongly accelerated by pressure. It leads to some six different isomeric products of which 1-methyl-4-isopropenylcyclohexene (I), 2-methyl-4-isopropenylcyclohexene (II) and 4-ethenyl-2,4-dimethylcyclohexene (III) are present in the largest quantity. At ordinary pressures the intermediate diradical has a head-to-tail structure, while pressure increases the amount of symmetric tail-to-tail intermediate.

Oregon State Coll., Corvallis.
THE PREPARATION OF TRIFLUOROMETHYL-SUBSTITUTED BORANES, by Theran D. Parsons. Technical rept. no. 1 on Contract Nonr-1286(04). 31 Aug 58, 11p. 10 refs.
Order from LC mi$2.40, ph$3.30 PB 140 895

The purpose of this research is to prepare and study compounds in which one or more trifluoromethyl group is bonded to the boron atom.

Purdue U., Lafayette, Ind.
AN APPLICATION OF THE HAMMETT EQUATION TO SUBSTITUTED FERROCENE CARBOXYLIC ACIDS, by Robert A. Benkeser and Lewis W. Hall, Jr. Rept. on Contract AF 49(638)297. [1958] 9p. 14 refs. AFOSR TN-59-450; AD-215 025.
Order from LC mi$1.80, ph$1.80 PB 140 775

This report was previously announced in USGRR, v. 32, no. 2, with the incorrect PB number.

Purdue U., Lafayette, Ind.
NEW SYNTHESIS OF α-NITROESTERS, by Nathan Kornblum, Robert K. Blackwood and Jack W. Powers. Rept. on Chemistry of Aliphatic and Alicyclic Nitro Compounds, Contract AF 18(600)310. [1956] 13p.

17 refs. AFOSR TN-56-431; AD-96 514.
Order from LC mi$2.40, ph$3.30 PB 137 019

A simple new synthesis of α-nitroesters which involves treating α-haloesters with sodium nitrite in the presence of phloroglucinol is described; 66 to 91% yields of pure α-nitroesters are obtained.

Stanford Research Inst., Menlo Park, Calif.
EFFECTS OF HIGH ENERGY, HIGH INTENSITY ELECTRO-MAGNETIC RADIATION ON ORGANIC LIQUIDS, by Robert M. Wagner and Leland H. Towle. Rept. for 1 May-31 Oct 58 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)3738. Mar 59, 43p. 13 refs. WADC Technical rept. 58-683; AD-211 915.
Order from OTS $1.25 PB 151 836

Practical nuclear power applications require organic materials which offer optimum resistance to undesirable effects of radiation. Hydraulic and lubricating fluids in nuclear power auxiliary equipment are cases in point. Some of these may of necessity be located in a high flux density radiation field. This study of several representatives of different types of organic structure was an attempt to provide background information which may suggest methods of judicious choice for efficient design of radiation-resistant equipment. The following compounds were subjected to high energy electron or gamma bombardment: aromatic amines, aromatic nitro compounds, alkyl aromatic ethers, alkyl aromatic hydrocarbons, and aliphatic esters. In addition, alkyl aromatic compounds and aliphatic esters were subjected to high energy neutron bombardment.

Physical Chemistry

Aerojet-General Corp., Azusa, Calif.
THEORETICAL STUDY OF THE RECOMBINATION KINETICS OF ATOMIC OXYGEN, by Sterge T. Demetriades and Milton Farber. Rept. on Contract AF 49(638)111. 8 Nov 57, 64p. 42 refs. Rept. no. TN-21; AFOSR TN-58-18; AD-148 057.
Order from LC mi$3.90, ph$10.80 PB 136 998

Favorable conditions are determined for the study of the recombination kinetics of atomic oxygen. A rate constant for the oxygen-recombination mechanism, $0 + 0 + M \rightarrow 0_2 + M$, of the order of 10^{15} to 10^{16} $cc^2/mole^2$-sec, depending on the temperature, has been derived theoretically. For a recombination rate of this magnitude, static experiments can be performed in the range of temperatures from 1500 to 2000°K and pressures of the order of 10^{-3} atoms, provided that the wall recombination is not faster than predicted by the rate of collisions of colliding oxygen atoms with the wall. The present estimate of the rate of oxygen recombination is compared with previous estimates and with the rate of oxygen-molecule production due to wall recombination and to the ozone-recombination machanism, $0_3 + 0 \rightarrow 2O_2$. If the recombination-rate constant for the three-body homogeneous process is below 2×10^{15} $cc^2/mole^2$-sec or the wall recombination is a first-order process, dynamic experiments would be required to eliminate wall effects.

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
FLAME FRONT STRUCTURES OF LEAN DIBORANE-AIR AND DIBORANE-HYDROCARBON-AIR MIXTURES, by P. Breisacher, D. Dembrow, and W. G. Berl. Rept. on Contract NOrd-7386. July 58, 31p. 9 refs. CM-943.
Order from LC mi$3.00, ph$6.30 PB 140 885

An experimental study was made of the structure of diborane-hydrocarbon-air flames by means of temperature and composition profiles. Flate flames were examined at a pressure of 1/7 atmosphere. In the presence of hydrocarbons, only a single luminous reaction zone may be formed with lean diborane-air mixtures.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE LIMITATIONS OF THE REFLECTED SHOCK TECHNIQUE FOR STUDYING FAST CHEMICAL REACTIONS AND ITS APPLICATION TO THE OBSERVATION OF RELAXATION IN NITROGEN AND OXYGEN, by Roger A. Strehlow and Arthur Cohen. Dec 58, 28p. 14 refs. Rept. no. 1059.
Order from LC mi$2.70, ph$4.80 PB 139 544

Strip film and multiple spark schlieren pictures of reflected shocks were taken in the gases He, A, N_2, O_2, H_2, NO, CO_2, N_2O, CH_4, and C_3H_8. Interaction of the reflected shock with the boundary layer behind the incident shock was observed in all gases except He and A.

Bureau of Mines, Bartlesville, Okla.
BENZOTRIFLUORIDE: CHEMICAL THERMODYNAMIC PROPERTIES AND INTERNAL ROTATION, by D. W. Scott, D. R. Douslin and others. Technical note on Contract CSO 680-57-4. 18 Aug 58, 29p. 28 refs. AFOSR TN-58-747; AD-201 515.
Order from LC mi$2.70, ph$4.80 PB 136 876

The chemical thermodynamic properties in the vapor state (0 to 1500°K.) were calculated by methods of statistical mechanics.

Cornell U., Ithaca, N. Y.
DIFFUSION OF SMALL MOLECULE PENETRANTS IN POLYMERIC MATERIALS, by F. A. Long. Final rept. on Contract DA 30-115-ORD-701. 22 Aug 58, 8p. 15 refs.
Order from LC mi$1.80, ph$1.80 PB 140 882

Covered largely by publications. These are listed. Work in progress is also covered briefly.

Fairchild Engine Div., Deer Park, N. Y.
AEROTHERMODYNAMIC AND ELECTRICAL PROPERTIES OF SOME GAS MIXTURES TO MACH 20, by W. Chinitz, C. L. Eisen, and R. A. Gross. Rept. on Contract AF 49(638)15. 1 Oct 58, 30p. 11 refs. AFOSR-TN-58-869; AD-203 666.
Order from LC mi$2.70, ph$4.80 PB 140 848

Pressure, temperature, chemical composition and electrical conductivity data are presented for gas

mixtures behind strong air shocks and detonations of hydrogen-air and acetylene-air mixtures up to Mach 20. A digital computer program has been developed which solves the simultaneous aerodynamic and chemical equilibrium equations. The latest thermodynamic and collision cross section data are used. Data are also presented wherein the initial gas composition was varied to obtain the maximum electrical conductivity for a given shock or detonation strength.

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
INFRARED ABSORPTIVITIES AND EMISSIVITIES OF GASES, by A. Thomson, W. J. Hooker, and S. S. Penner. Technical rept. no. 26 on Contract Nonr-220(03). June 58, 6p. 12 refs.
Order from LC mi$1.80, ph$1.80 PB 139 652

Extensive theoretical studies relating to the calculation of infrared absorptivities and emissivities have been performed. A brief summary is presented of some of the more important results and reference made to the original doctoral dissertations and to a text which is currently in press for further details.

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
RELATION BETWEEN GAS ABSORPTIVITIES AND EMISSIVITIES, by D. Olfe and S. S. Penner. Technicla rept. no. 27 on Contract Nonr-220(03). June 58, 5p. 6 refs.
Order from LC mi$1.80, ph$1.80 PB 139 650

Horizons, Inc., Cleveland, Ohio.
STUDIES OF RARE EARTH CARBIDES. I, by R. C. Vickery, R. Sedlacek, and Ardys Ruben. Technical note no. 1 on Contract AF 49(638)80. 2 Jan 58, 16p. 12 refs. AFOSR-TN-58-38; AD-148 079.
Order from LC mi$2.40, ph$3.30 PB 137 000

The synthesis and some properties of the higher carbides of some rare earths are reported. The reaction exploited is that between rare-earth oxides and carbon at high temperatures and under low pressure of argon. Carbide formation proceeds via metal production, and interstitial compounds can exist of rare-earth metal held in the carbide lattice. The higher carbides (LnC_2) adopt a tetragonal structure, but scandium differs from the lanthanons and yttrium in forming only a hexagonal monocarbide (ScC); this is basically attributed to the small size of the scandium ion which sterically permits its association with only one carbon atom.

Horizons, Inc., Cleveland, Ohio.
STUDIES ON RARE EARTH CARBIDES. III, by R. C. Vickery, R. Sedlacek, and Ardys Ruben. Technical note no. 3 on Contract AF 49(638)80. 17 July 58, 12p. 11 refs. AFOSR TN-58-593; AD-162 117.
Order from LC mi$2.40, ph$3.30 PB 136 994

K-edge absorption of some rare-earth carbides has been studied in further attempts to rationalise the structure of these compounds. The attainment of bivalent states in samarium and ytterbium carbides receives further confirmation, whilst from consideration of energy values the "free electron" concept appears substantiated. (See also PB 137 000)

Howe Sound Co., Salt Lake City, Utah.
ELECTRODEPOSITION OF COBALT BASE ALLOYS, by W. Martin Fassell, Jr. and John P. Baur. Final technical rept. for 1 Apr 57-1 Jan 58 on Contract DA 04-495-505-ORD-862 500-1. 16 May 58, 136p. 23 refs. WAL-317/6-2.
Order from LC mi$6.90, ph$21.30 PB 140 954

Electrodeposition of cobalt-chromium binary deposits was attempted from the following general bath types: mixed $CoSO_4$-$Cr_2[SO_4]_3$; mixed $CoCl_2$-CrO_3; mixed $CoSO_4$-CrO_3; mixed $CoSO_4$-chrome alum; and baths containing chromous ion. Serious difficulty was encountered in producing uniform deposits over the surface of the cathode. Nearly all deposits showed banding in texture and composition. Attempts were also made to electrodeposit binary and ternary deposits from baths containing cobalt, chromium, tungsten and molybdenum.

Institute for Cooperative Research, Johns Hopkins U., Baltimore, Md.
RESEARCH ON COMBUSTION RATES IN FUEL-AEROSOL VAPOR MIXTURES, by H. E. Hoelscher. Final rept. on Contract AF 18(600)1176. Nov 58, 58p. AFOSR TR-58-165; AD-208 081.
Order from LC mi$3.60, ph$9.30 PB 139 605

The principal contribution from this work has been the definition of two new flame systems: the first being the free flat flame described by Biedler and Hoelscher; the second being the travelling flame developed by Levine and Weger. The former is most applicable to studies of the kinetics of combustion reactions whereas the latter is most properly directed toward the study of flame stability. The operating characteristics of these two flame systems have been studied and described. The optimum direction for future research on these problems has been indicated.

[Institute for Fluid Dynamics and Applied Mathematics] U. of Maryland, College Park.
SELECTED TOPICS FROM THE THEORY OF GAS FLOW AT HIGH TEMPERATURES (III). PROBLEMS OF GAS FLOW IN WHICH ACCOUNT MUST BE TAKEN OF DIFFUSION, by J. M. Burgers. Rept. on Contract AF 18(600)993. Mar 57, 67p. 6 refs. Technical note BN-99; AFOSR TN-57-284; AD-132 355.
Order from LC mi$3.90, ph$10.80 PB 137 093

Attention is given to the production or disappearance of molecules in consequence of chemical reactions. The diffusion has been treated on the basis of a method developed by M. Krook (Phys. Rev. (2) 99, pp. 1896-1897, 1955), leading to equations of a relatively simple structure. The method operates with certain mean values for the collision frequency in which no account is taken of the variations in speed of the molecules. An extension is indicated which brings a partial correction for the effect of the speed.

Instituto Nacional de Tecnica Aeronautica Esteban Terradas (Spain).
COMBUSTION OF MONOPROPELLANT DROPLETS: THEORETICAL RESULTS, by C. Sanchez Tarifa and P. Perez del Notario. Rept. on Contract AF 61(514)997. 15 Dec 58, 55p. 4 refs. AFOSR TN-59-463; AD-215 268.
Order from LC mi$3.60, ph$9.30 PB 140 776

The following problems have been studied: (1) extension of the integration method for overall reactions of n^{th} order and Lewis-Semenov numbers different from one; (2) comparison of the results for second order chemical kinetics with those obtained by means of numerical integration of the equations; (3) results of the investigation for first and second order chemical kinetics; (4) numerical application for hydrazine, taking the decomposition reaction model proposed by Adams and Stock; and (5) analysis and discussion of the results.

James Forrestal Research Center, Princeton, N. J.
A LINEAR CORRELATION OF VISCOSITY, SURFACE TENSION AND TEMPERATURE, by Donald R. MacRae and Ernest F. Johnson. Rept. on Contract Nonr-1858(25). Aug 58, 51p. 51 refs. Proj. Squid Technical rept. PR-81-R.
Order from LC mi$3.60, ph$9.30 PB 140 884

This report presents a new correlation of viscosity, surface tension, and temperature from the melting point to the critical temperature. The unique value of the relation is that it is linear over the entire temperature range. This linear form allows the entire viscosity-temperature curve to be estimated from a single experimental viscosity value and surfact tension and density data over the desired temperature range.

Laboratoire Mediterraneen de Recherches Thermodynamiques (France).
USE OF THE REVOLVING ARM METHOD FOR THE DETERMINATION OF THE STAGNATION TEMPERATURE IN AN IONIZED GAS, by F. Marcel Devienne, André F. Roustan and others. Technical note on Contract AF 61(514)1126. Feb 59, 23p. 5 refs. AFOSR TN-59-196; AD-211 473.
Order from LC mi$2.70, ph$4.80 PB 139 554

The use of the revolving arm method with regard to the determination of phenomena which occur during the displacement of a body in an ionized atmosphere is described. By means of this method it is possible to carry out measurements on ionized gases which have a relatively strong ionic predominance. Measurements can be made of the state of ionization of the gas and the influence of the displacement velocity of a body on the recombination rate of the ions on the surface of the moving body.

Little, Arthur D., Inc. [Cambridge, Mass.]
A NEW INSTRUMENT FOR THE DETERMINATION OF MOLECULAR WEIGHT BY DIFFERENTIAL VAPOR PRESSURE, by Norman M. Wiederhorn, Jay H. Vreeland, and Robert R. Perron. Rept. for Feb-Oct 58 on Experimental Techniques for Materials Research, Contract AF 33(616)5483. Mar 59, 37p. 2 refs. WADC Technical rept. 58-623; AD-211 914.
Order from OTS $1.00 PB 151 832

A differential vapor pressure molecular weight instrument has been developed and constructed. The method developed is suitable for determining molecular weights of sparingly soluble (0.1% by weight) compounds in the 400 to 2000 molecular weight range to an accuracy of ± 5%. The measurement involves a determination of the lowering of the vapor pressure by a known weight of material. For this purpose a differential pressure cell possessing the requisite sensitivity of 4 microns of mercury as well as necessary cells were constructed. This high sensitivity has been attained by using a metal foil as sensing element and determining its displacement by measuring the change in capacitance between the foil and a fixed test electrode. The necessary control of temperature gradients to ± 0.0001°C was accomplished and preliminary calibration and investigation on sucrose solutions.

Louvain U. (Belgium).
DETERMINATION OF ACTIVATION ENERGY AND REACTION ORDER IN PREMIXED LAMINAR FLAMES, by A. Van Tiggelen. Technical summary rept. on Contract AF 61(514)1245. Feb 59, 58p. 56 refs. AFOSR TR-59-36; AD-213 039.
Order from LC mi$3.60, ph$9.30 PB 140 778

The theoretical basis is discussed for the determination of the activation energy and of the reaction order with respect to fuel and oxidant from experimental data on burning velocities. The theory is based on the branching condition in the flame front.

Minerals Research Lab., U. of California, Berkeley.
FORMATION OF $BaTiO_3$ FROM $BaCO_3$ AND TiO_2 IN AIR AND CO_2, by Lieselotte K. Templeton and Joseph A. Pask. Technical rept. no. 6 on Contract N7onr-295(24). June 58, 22p. 10 refs. Series no. 18, issue no. 6.
Order from LC mi$2.70, ph$4.80 PB 139 649

The formation of $BaTiO_3$ from equimolar $BaCO_3$ and TiO_2 (rutile) mixtures was studied in air and in CO_2. A small amount of $BaTiO_3$ is formed first directly from $BaCO_3$ and TiO_2 at the surface of contact. From then on it is a diffusion controlled reaction, and both $BaTiO_3$ and $BaTiO_4$ are produced, with Ba_2TiO_4 being formed in much larger amounts.

Naval Ordnance Lab., White Oak, Md.
THE INFLUENCE OF THE ABSORPTION OF RADIATION IN SHOCK TUBE PHENOMENA, by Jacob Pomerantz. 15 Aug 58, 144p. 61 refs. NAVORD rept. 6136.
Order from LC mi$7.20, ph$22.80 PB 140 727

A theoretical investigation is made of the influence of the absorption of continuum radiation on the gas flow variables behind a strong shock wave advancing into argon at room temperature. A derivation of the emission formula for the total continuum radiation from an ionized gas brings out the need for knowing the amount that the ionization potential is lowered in

a plasma. A review of the literature led to the choice of Ecker and Weizel's expression for the ionization potential lowering. Numerical results obtained by combining this expression with the usual shock equations are presented for the equilibrium conditions that are assumed to exist at the plane of maximum luminosity.

Naval Research Lab., U. of Wisconsin, Madison.
ELEMENTARY TREATMENT OF LAMINAR FLAME PROPAGATION, by Joseph O. Hirschfelder, Alan McCone, Jr., and Theodore Odell. Rept. on Contract NOrd-15884. 11 Aug 58, 59p. 1 ref. CM-934.
Order from LC mi$3.30, ph$7.80 PB 140 889

A mathematical and graphical approach.

North Carolina U., Chapel Hill.
FINAL REPORT, by O. K. Rice. Rept. on Contract N7onr-284(07). 31 Dec 57, 8p. 21 refs.
Order from LC mi$1.80, ph$1.80 PB 137 275

The work under this contract has dealt principally with two subjects, critical phenomena in binary liquid systems, and the theory of liquid helium. These subjects have some points of contact but will be dealt with separately in this report. At the end will be found a bibliography and a list of technical reports.

Notre Dame U., Ind.
THE KINETICS OF SrO ON W AND Mo BY FIELD ELECTRON MICROSCOPY. PART II, by J. A. Cape and E. A. Coomes. Reprint series, Technical rept. on Contract Nonr-1623(01). 15 Aug 58, 27p. 10 refs.
Order from LC mi$2.70, ph$4.80 PB 140 911

Ohio State U. Research Foundation, Columbus.
DEVELOPMENT OF AN OXIDATION RESISTANT COLUMBIUM ALLOY, by Rudolph Speiser. Rept. no. 17, 16 Apr-15 Aug 58, on Contract N6onr-225(28). 18 Aug 58, 24p. 5 refs. Rept. 467-17.
Order from LC mi$2.70, ph$4.80 PB 140 762

Ternary alloys in the Cb-Zr-Ti system were prepared. 50 a/o Zr, 45 a/o Cb, 5 a/o Ti, was found to possess the best combination of low oxidation rate and nonporous adherent oxide film.

Pennsylvania State U. Coll. of Mineral Industries, University Park.
THE MECHANISM AND THE KINETICS OF HYDROLYSIS AND HYDRATION REACTIONS, by Evelyn Chostner Marboe and Woldemar A. Weyl. Technical rept. no. 75 on Contract N6onr-269(08). Dec 57, 97p. 45 refs.
Order from OTS $2.50 PB 151 439

Rate phenomena of chemical reactions are treated theoretically by introducing the concept of polarizability which allows the collision theory to be dispensed with since it cannot explain the mechanism of hydrolysis and hydration in aqueous solution where hydrogen bonds link the solute to the H_2O network. Polarizability is strongly affected by environmental conditions such as temperature which keeps the system in permanent thermal vibrations and causes continuous fluctuations of both the geometry of ions and their screening effect for protons and anions. This brings in the time factor, which is disregarded in classical thermodynamics, as well as atomic and molecular structure. An increase in the internuclear distance enhances chemical reactivity as it increases the polarizability of anions and reduces their screening effect against the intrusion of H^+ or OH^- ions into the solid causing its hydration or into the molecule causing its hydrolysis. Polarizability of anions is an expression of their basicity and explains their effect upon the cations of H_2O. NaOH is one of the most polarizable compounds and a strong base, while $HClO_4$ is one of the least polarizable ones and a strong acid. Hydration is an acid-base reaction such as in the formation of ammonia: $NH_3 + H_2O \rightarrow NH_4^+ + OH^-$, where H_2O acts as an acid. Many other common reactions are explained by the concept of polarizability. (See also PB 151 440)

Stanford U., Calif.
THE PROPERTIES OF DETERGENT SOLUTIONS, by Eric Hutchinson. Rept. no. 1 on Contract Nonr-2256(00). Dec 57, 5p. 2 refs.
Order from LC mi$1.80, ph$1.80 PB 137 273

During the past year experimental work has been concentrated on problems dealing with the ultrafiltration of detergent solutions. A part of the theoretical treatment of solubilization involves the postulate that solubilized materials are distributed between 'aqueous solution' and detergent micelles.

Texas U., Austin.
CAPACITIES OF SOLID METAL-SOLUTION INTERFACES, by Norman Hackerman and J. J. McMullen. Technical rept. on Contract Nonr-375(02). 1 Aug 58, 28p. 19 refs.
Order from LC mi$2.70, ph$4.80 PB 140 912

An electric analog of the metal-solution interface was assumed and E vs. t changes were deduced mathematically for application of a square wave voltage. The method was applied to each of the following systems: mercury in 0.1N Na_2SO_4, platinum, silver, copper, aluminum and tantalum in 1N Na_2SO_4.

University of Southern California, Los Angeles.
NUMERICAL APPROACH TO THE PROBLEM OF SEDIMENTATION VOLUME, by M. J. Vold. Technical rept. no. 5, 1 May-15 Aug 58, on Contract AF 18(603)122. Aug 58, 10p. 5 refs. AFOSR TN-58-843; AD-203 333.
Order from LC mi$1.80, ph$1.80 PB 137 051

The present work is part of a program designed to compute the sediment volume numerically for systems of particles of various sizes and shapes with various well defined mechanics of interaction. It describes the method of computation and presents some results for spherical particles and for simulated rod-like particles built of aggregates of spheres upon the assumption that permanent cohesion occurs between particles upon first contact.

University of Southern California, Los Angeles.
TRANSPORT PROCESSES IN LIQUID SYSTEMS, by Arthur N. Adamson. Final rept. for 27 June 52-15 Jan 57 on Contract DA 04-495-ORD-364. [1957] 40p. 23 refs.
Order from LC mi$3.00, ph$6.30 PB 137 253

The original proposal was concerned with the study of the diffusional behavior of ions and of neutral molecules in liquid solutions. The authors in addition, have obtained a complete set of physical data on two systems, that of sucrose in water, and that of water itself.

Uppsala U. (Sweden).
RESEARCH ON METALLIC PHASES IN SYSTEMS OF TRANSITION METALS WITH NON-METALS, by G. Hägg. Annual technical summary rept. no. 1 on Contract AF 61(052)40. 31 Dec 58, 6p. AFOSR TN-59-225; AD-211 607.
Order from LC mi$1.80, ph$1.80 PB 139 572

Studies of crystal structures of inter-metallic compounds of nickel, ruthenium, rhodium, manganese, and iron with the non-metals boron, silicon, and phosphorus.

EARTH SCIENCES

Air Force Cambridge Research Center, Bedford, Mass.
PROCEEDINGS OF THE ANNUAL ARCTIC PLANNING SESSION [NO. 1] NOVEMBER 1958, by J. H. Hartshorn. Apr 59, 79p. 14 refs. GRD Research Notes no. 15; AFCRC TN-59-256; AD-212 265.
Order from OTS $2.00 PB 151 839

This is a summary of talks on the subjects of: Lake Peters - The Arctic Coastal Research Program; The Ice-Free Land Program; Arctic Ocean Studies; Arctic Lake Research; and related topics of general interest.

Climatology and Meteorology

Cloud Physics Lab., U. of Chicago, Ill.
COMPARATIVE FLIGHT TEST OF THREE INSTRUMENTS FOR MEASURING CLOUD WATER CONTENT, by Earl W. Barrett. Final rept. on NSF Grant G-2164. 31 May 58, 26p. 2 refs. Cloud Physics Lab. Technical note no. 14.
Order from LC mi$2.70, ph$4.80 PB 137 050

Some data obtained during cloud penetrations with the chemical conductometric device and capillary collector probe, the paper-tape conductometric probe and the heated-wire probe are presented and discussed in this report. Operational characteristics of the three devices are described, with emphasis on the chemical conductometric instrument.

Deutscher Wetterdienst, Aachen (Germany).
THE ATMOSPHERIC ELECTRICAL CLIMATE AT FOUR SELECTED STATIONS IN THE SWISS ALPS, II. SOME EXAMPLES FOR FURTHER CLIMATOLOGICAL STUDIES, by H. Israel. Technical note no. 13 on Contract AF 61(514)640. 1 July 57, 52p. 39 refs. AFCRC-TN-58-430; AD-152 601.
Order from LC mi$3.60, ph$9.30 PB 137 360

Some climatic elements and climatological features are discussed for 4 atmospheric electric-meteorological stations in the Swiss Alps area. Diurnal and annual variations for the air-earth current are given by comparing frequency and amplitude of noise. Problems arising with the determination of columnar resistance are calculated for 2 imaginary air columns, the first above a level station and the second above a mountain station. Differences in the so-called atmospheric electric sunrise and the local sunrise effects on the motion of air are related. Studies of diurnal variations of the negative and positive polar measured conductivities reveal the different and much more unsteady character of the negative conductivity. The seeming non-fulfillment of Ohm's laws, separation of measured material according to wind direction, and comparisons of measurements and individual effects at the 4 stations are presented.

Deutscher Wetterdienst, Aachen (Germany).
CONDENSATION NUCLEI AND ATMOSPHERIC CONDUCTIVITY AT JUNGFRAUJOCH (SWITZERLAND) by H. Israel. Technical note no. 9 on Contract AF 61(514)640. 1 Feb 57, Sup. 1957. 94p. 47 refs. AFCRC-TN-58-432; AD-152 603.
Order from LC mi$5.30, ph$15.30 PB 137 362

This paper deals with the question of finding a correlation between the content of condensation nuclei in the atmospheric air and the electric conductivity of the air. The first section offers an introduction to this problem. The second section deals with the recombination equations and the difficulties involved in their solution. The third section treats the measuring methods. The fourth section reports the measuring results and their evaluations. Section five gives a short summary of the results.

Deutscher Wetterdienst, Aachen (Germany).
OZONE MEASUREMENTS IN THE FRAME OF THE "ALPS-PROJECT", by H. Israel. Technical note no. 14 on Contract AF 61(514)640. 15 July 57, 12p. 3 refs. AFCRC TN-58-429; AD-152 600.
Order from LC mi$2.40, ph$3.30 PB 137 358

Supplementary measurements determining the atmospheric ozone content close to ground were carried out in the frame of the atmospheric electric synoptic investigations in the region of the Swiss Alps 1954/55 at some stations. The measurements were made according to the technique developed by A. Ehmert. The results of the observations are communicated in this paper - for the time being without any further treatment. Reports of the climatological and synoptic comparison of the results with atmospheric electric and meteorological data will be given at a later date.

Deutscher Wetterdienst, Aachen (Germany).
REMARKS ON THE ELECTRICAL CONDITIONS DURING DISTURBED WEATHER, by H. Israel. Technical note no. 12 on Contract AF 61(514)640.
25 Aug 57, 27p. 19 refs. AFCRC-TN-58-431; AD-152 602.
Order from LC mi$2.70, ph$4.80 PB 137 361

From the material of the "Alps Project 1954/55" incidentally obtained on the behavior of the atmospheric electric elements during disturbed weather some examples are quoted here of which it is assumed that they may help promote the understanding of bad weather atmospheric electricity.

Florida State U., Tallahassee.
OPTIMUM UTILIZATION OF SATELLITE OBSERVATIONS IN WEATHER ANALYSIS AND FORECASTING by Warren A. Dryden and Norman E. Prosser. Final rept. on Contract AF 19(604)1754. 1 Feb 59, 99p. 82 refs. AFCRC TR-58-273.
Order from LC mi$5.40, ph$15.30 PB 139 637

A discussion of several types of weather observations, which might be obtained from a suitably-instrumented, artificial, earth satellite, is presented, and the possible uses to which these observations might be put in an attempt to improve the current status of short-range forecasting are considered. In a resume of a scientific report, some satellite orbits are discussed that appear to be useful in the high-level observation and tracking of tropospheric disturbances. Another scientific report, dealing with inferences of synoptic conditions from high-level rocket photographs is summarized. In an attempt to determine the value of cloud observations for inferring the weather patterns in the atmosphere, three case studies of nephanalyses are presented. The problem of the resolving power necessary to identify clouds from extremely high altitudes is discussed.

Institute of Mathematical Sciences, New York U., N. Y.
RESEARCH ON THEORETICAL FLUID MODELS, by Sherman C. Lowell. Final rept. for 1 Apr 57-31 Aug 58 on Contract AF 19(604)2265. 26 Sep 58, 10p. 6 refs.
Order from LC mi$1.80, ph$1.80 PB 137 185

Naval Research Lab., Washington, D. C.
UTILIZATION OF TRANSOSONDE DATA, by H. J. Mastenbrook. Interim rept. 18 May 59, 13p. NRL rept. 5310.
Order from LC mi$2.40, ph$3.30 PB 138 797

The Navy transosonde system has been installed in the Pacific area on an operational basis and provides currently a trajectory form of meteorological data for utilization in the analysis of this region. Transosonde flight 202 has been examined in terms of its contribution to the analysis of the 250-millibar pressure surface. Consideration was based upon a careful study of the sequence of map analyses prepared by the National Weather Analysis Center for the period of this flight. Flight 202 is observed to have provided a more or less zonal sweep of the Pacific, defining the major configurations along the flight path. The effect was to pinpoint the major features of the circulation on the appropriate synoptic charts and to provide a general firming up of the analysis throughout the entire zone of the trajectory sweep.

Stanford Electronics Labs., Stanford U., Calif.
MOTION OF SPORADIC-E PATCHES DETERMINED FROM HIGH FREQUENCY BACKSCATTER RECORDS, by C. Clark. Technical rept. no. 24 on Contract Nonr-225(24). 18 Sep 57, 112p. 39 refs.
Order from LC mi$6.00, ph$18.30 PB 137 277

Speed and direction distributions are presented along with geographic, diurnal and seasonal occurrence information. The speed distribution is peaked at 250 km/hr with a very few cases as high as 1000 km/hr and a few cases less than 100 km/hr. The direction of motion is predominantly toward the west but patches were observed to move in other directions.

Washington U., Seattle.
ARCTIC WEATHER ANALYSIS AND FORECASTING, by Richard J. Reed. Scientific rept. no. 2 on Contract AF 19(604) 3063. Jan 59, 122p. 63 refs. Meteorology and Climatology. Occasional rept. no. 11; AFCRC TN-58-647.
Order from LC mi$6.30, ph$19.80 PB 139 559

The emphasis in the monograph is primarily on describing and understanding the workings of the polar atmosphere and secondarily on methods and procedures for dealing with specific problems of polar meteorology.

Geodesy

Broadview Research Corp., Burlingame, Calif.
QUANTITATIVE EVALUATION OF PHOTO INTERPRETATION KEYS, by R. De Lancie, W. W. Steen and others. Final rept. on Contract AF 30(602)1503. May 57, 64p. BRD-57-3F3; RADC TR-57-130C; AD-131 198.
Order from LC mi$3.90, ph$10.80 PB 139 643

The major purposes of this project were: (1) to compare the effectiveness of the different ways of organizing reference material (keys); (2) to determine the extent to which the value of a key type depends upon the experience of the user; and (3) to determine the extent which the value of a key type depends upon the nature of the subject. The approach used was to administer a series of tests in which testees attempted to identify a number of objects, using various types of reference material. Prior to the final testing program numerous preliminary tests were run to order to estimate variance and to check out test procedures.

Columbia U., New York.
TERRAIN ANALYSIS BY PHOTO INTERPRETATION, by Arthur N. Strahler. Semi-annual status rept. on Contract Nonr-266(50). 15 Nov 57, 6p.
Order from LC mi$1.80, ph$1.80 PB 137 091

Quartermaster Research and Engineering Center, Natick, Mass.
A DEVICE AND METHOD FOR ANALYZING LINE OF SIGHT, by Joan B. Snell. Nov 58, 23p. 9 refs. Technical rept. EP-101.
Order from LC mi$2.70, ph$4.80 PB 139 534

A map-interpretation tool has been developed to quickly and accurately aid in the solution of various problems concerning line of sight between or beyond two points, on, below, or above the earth's surface. The apparatus consists of a transparent plastic base inscribed with a series of parallel horizontal lines to represent elevations on a map; a movable vertical line to locate horizontal distances on a map; and another movable line which pivots at an angle to simulate a line of sight between two points. The device eliminates the time-consuming process of drawing earth profiles. This is done by positioning the device on a contour map, establishing the line of sight between the two points, and constructing on the device an imaginary profile. Many applications of the basic principle of the device can be made and a variety of problems solved with it.

Quartermaster Research and Engineering Center, Natick, Mass.
GROUND SURFACE SHOCK ABSORBENCY, by Robert L. Anstey. Apr 58, 19p. Research Study rept. RER-17.
Order from LC mi$2.40, ph$3.30 PB 140 750

Shock absorbency of various types of ground was tested by dropping impactographs from different heights on a 16-foot drop tower. Results showed that water has the greatest shock absorbency of all the surface materials included in this study. However, the problems connected with recovery, and possible damage to items by water itself seriously lessen its value as a drop surface. Shallow water tends to reflect the shock absorbency characteristics of its underlying material.

Oceanography

New York U. Coll. of Engineering, N. Y.
THEORETICAL AND OBSERVED RESULTS FOR THE ZERO AND ORDINATE CROSSING PROBLEMS OF STATIONARY GAUSSIAN NOISE WITH APPLICATION TO PRESSURE RECORDS OF OCEAN WAVES, by Sylvain Ehrenfeld, Nathaniel R. Goodman and others. Technical rept. no. 1 on Contract NObs-72018. Dec 58, 232p. 29 refs.
Order from LC mi$10.20, ph$36.80 PB 140 755

Washington U., Seattle.
THE MEASUREMENT OF TRANSPORTS AND CURRENTS IN SMALL TIDAL STREAMS BY AN ELECTROMAGNETIC METHOD, by Richard M. Morse, Maurice Rattray, Jr. and others. Technical rept. no. 57 on Contract Nonr-477(10). Aug 58, 75p. 18 refs. Ref. no. 58-1.
Order from LC mi$4.50, ph$12.30 PB 140 872

Satisfactory observations have now been extended to very small streams, the electromagnetic method for measurement of tidal stream velocities and transports is considered proved to a degree sufficient to justify its classification as a practical oceanographic tool. Some consideration is taken of how transports or potentials may be affected by meteorological factors, by runoff, and by anomalous water-motions in adjacent large channels.

Washington U., Seattle.
A MODIFICATION OF THE WENNER-SMITH-SOULE SALINITY BRIDGE FOR THE DETERMINATION OF SALINITY IN SEA WATER, by Robert G. Paquette. Technical rept. no. 61 on Contract Nonr-477(10). Aug 58, 64p. 5 refs. Ref. no. 58-14.
Order from LC mi$3.90, ph$10.80 PB 140 874

A bridge is described for the determination of the salinity of sea water on s ship at sea by an electrical conductivity method. The device is believed to be an improvement over the bridge of Bradshaw and Schleicher. A method of controlling refrigerated bath temperatures to $\pm$ 0.01°C. is described. Details of construction, and maintenance are given applying to six bridges constructed to date.

Washington U., Seattle.
PHYSICAL AND CHEMICAL DATA, GULF OF ALASKA, SPRING AND SUMMER 1956 AND SPRING 1957, by Cuthbert M. Love. Technical rept. no. 56 on Contracts Nonr-477(10) and Nonr-477(01). Sep 57, 93p. 7 refs. Ref. 57-28; AD-144 195.
Order from LC mi$5.40, ph$15.30 PB 137 042

This report presents physical and chemical data collected in the Gulf of Alaska during the spring and summer of 1956 and in the spring of 1957. Observations were made during three cruises of the research vessel Brown Bear of the University of Washington, Department of Oceanography. Charts show the positions of stations sampled. Tables give values, over a range of selected depths, for temperature, salinity, density, dissolved oxygen, and dissolved inorganic phosphate.

Washington U., Seattle.
THE USE OF A LARGE CAPACITY PORTABLE PUMP FOR PLANKTON SAMPLING, WITH NOTES ON PLANKTON PATCHINESS, by William Aron. Technical rept. no. 59 on Contract Nonr-477(10). Aug 58, 27p. 20 refs. Ref. no. 58-20.
Order from LC mi$2.70, ph$4.80 PB 140 873

A centrifugal pump with rated capacity of 400 gallons/minute was used for plankton sampling. The pumped water was passed through a special filtering unit and damage to the plankters was negligible. The use of large capacity pumps is recommended for further investigations of horizontal and vertical distribution of plankton.

Woods Hole Oceanographic Institution, Mass.
HYDROBIOLOGICAL MEASUREMENTS ON T3, 1957-58, by Spencer Apollonio. Oct 58, 10p. 3 refs.
Order from LC mi$1.80, ph$1.80 PB 139 483

In order to determine the level of primary organic productivity in the Arctic Ocean certain measurements were made from May, 1957 to June, 1958, on Fletcher's Ice Island. This study included actual measurement of phytoplankton photosynthesis under the ice of the Arctic Ocean by the now standard Carbon 14 method, by the light and dark bottle oxygen method and by measurements of chlorophyll a concentrations and calculation of production from that data after the method of Ryther and Yentsch (1957). Productivity was also to be calculated from the variation of inorganic phosphate concentrations.

Woods Hole Oceanographic Institution, Mass.
PROJECT ICE SKATE OCEANOGRAPHIC DATA, by John S. Farlow, III. Rept. on NSF Grant no. Y/9.18/144. June 58, 20p. 2 refs. Reference no. 58-28.
Order from LC mi$2.40, ph$3.30 PB 139 490

In the present report are tabulated the hydrographic station data gathered at the two sites during the period May 1957 to May 1958.

Woods Hole Oceanographic Institution, Mass.
A RADIO TELEMETERING SYSTEM FOR OCEANOGRAPHY, by David H. Frantz, Jr., David D. Ketchum, and Robert G. Walden. Technical rept. on Contracts Nonr-769(00) and Nonr-2196(00). May 58, 80p. 12 refs. Ref. no. 58-29.
Order from LC mi$4.50, ph$12.30 PB 139 641

A radio telemetering system is described, which is useful for the measurement at a remote point of various parameters of interest to oceanographers. The basis of the system is a standardized buoy, which, with suitable modifications and additions, can be adapted for free-floating or anchored service in the deep ocean. The buoys contains a standard electronics unit of modular construction consisting principally of a medium frequency transmitter which can be energized by a receiver in the same unit. The receiver is sensitive only to certain coded signals originating from a ship, aircraft, or shore station up to 300 miles away. Various extra units can be plugged into the basic electronics unit with a minimum of rewiring to allow the buoy to perform a number of different functions.

Physics of the Atmosphere

Air Force Cambridge Research Center, Bedford, Mass.
OBSERVATIONS ON NICKEL-BEARING COSMIC DUST COLLECTED IN THE STRATOSPHERE, by Herman Yagoda. Mar 59, 19p. 3 refs. GRD Research notes no. 9; AFCRC TN-59-200; AD-212 422.
Order from OTS $0.50 PB 151 854

Stratospheric dust particles collected on plastic surfaces have been examined microchemically for the presence of nickel using dimethylglyoxime as a specific developing reagent. Samples collected from four balloon flights with plateau elevations between 77,000 and 112,000 feet indicate the deposition of 0.17 to 0.36 nickel bearing particles per cm^2 per day of exposure. Most of the color reactions for nickel vary between 20 and 40 microns diameter, but some dust particles as small as 1 or 2 microns have given positive reactions. Experimental details of the technique are described.

Denver U., Colo.
ATMOSPHERIC ABSORPTIONS IN THE NEAR INFRARED AT HIGH ALTITUDES, by David G. Murcray, James D. Brooks and others. Scientific rept. no. 1 on Contract AF 19(604)2069. 19 Mar 58, 22p. 6 refs. AFCRC-TN-58-269; AD-152 503.
Order from LC mi$2.70, ph$4.80 PB 136 877

This report presents the atmospheric absorption data obtained from a flight with a balloon borne infrared spectrometer. Records of the solar spectrum from 1 to 5 microns were obtained at various altitudes up to 96,600 feet. Attempts are made to correlate the data obtained with the theoretical work of Plass and that of Carpenter et al. Analysis of the data for the 4.3μ CO_2 band shows that it can be fitted by a relationship of the form $\int_{\nu_1}^{\nu_2} A_\nu d\nu = 45 \log pm + 63$

Harvard U., Cambridge, Mass.
LABORATORY STUDIES PERTAINING TO ATOMIC AND MOLECULAR REACTIONS AND RADIATIONS IN THE UPPER ATMOSPHERE, by N. P. Carleton. Final rept. on Contract AF 19(604)1041. 20 Jan 59, 17p. 16 refs. AFCRC TR-59-205; AD-211 924.
Order from LC mi$2.40, ph$3.30 PB 140 822

Work under this contract has consisted of laboratory experiments whose results, as well as being of general physical interest, will aid the study of atomic and molecular interactions in the upper atmosphere which can be roughly classified in three parts, i.e., molecular energy levels and thermal collisions between atoms and molecules, excitation by fast protons and with apparatus and techniques, including some information on adsorption of atoms and ions which may find direct application to problems of exposed instrumental surfaces in satellites and rockets.

Institute of Engineering Research, U. of California, Berkeley.
LOW DENSITY CHARACTERISTICS OF AN AEROBEE-HI PITOT-STATIC PROBE, by J. A. Laurmann. Technical rept. on Contract Nonr-2373(01). 20 May 58, 24p. 5 refs. HE-150-156; Series no. 20, issue no. 119.
Order from LC mi$2.70, ph$4.80 PB 139 646

Calibration studies of a model Aerobee-Hi pitot-static probe have been made in a low density wind tunnel in the Mach number range from 4 to 6 at pressures from 30 to 300 microns. Correct flight Mach and free stream Reynolds numbers were simulated for altitudes from approximately 40 to 70 kilometers, but ambient temperatures in the tunnel were too low to give correct correspondence of heat transfer effects. The yaw sensitivity of the pitot tube was also investigated, and for the latest design probe the pitot

pressure was found to drop 1% below the zero yaw value at a yaw angle of 12°. There was no evidence of flow separation induced by the presence of the nose cone in any of the flow conditions studied.

Ionosphere Research Lab., Pennsylvania State U., University Park.
A COHERENT DETECTION SYSTEM FOR A ROCKET-BORNE IONOSPHERIC SOUNDER, by T. P. Quinn. Scientific rept. no. 113 on Ionospheric Research, Contract DA 36-061-ORD-577. 15 Dec 58, 69p. 9 refs.
Order from LC mi$3.90, ph$10.80 PB 140 752

This experiment is designed to measure electron densities in the ionosphere by means of rocket-borne instruments. The preliminary design for two rocket-borne coherent detection systems is presented. The detection system for a daytime experiment is capable of detecting an ionosphere probe signal when the signal to noise ratio is much less than unity.

Johns Hopkins U., Baltimore, Md.
INFRARED ABSORPTION OF WATER VAPOR AT 1.8 MICRONS, by Louis F. Drummeter, Jr. Doctoral thesis. Rept. on Contract N5ori-166, T.O. 5. 2 June 49, 70p. 28 refs. ATI-85 225.
Order from LC mi$3.90, ph$10.80 PB 137 274

This thesis is divided into two parts. The second part describes the apparatus used in making them. The first part relates to measurements of the transmission of an absorption cell filled with various concentrations of water vapor and methane.

ENGINEERING

Naval Engineering Experiment Station, Annapolis, Md.
INHIBITORS OF INJECTOR CORROSION BY SEA WATER IN DIESEL FUEL, by N. Glassman, R. E. Anderson, anf F. C. Sernatinger. Progress rept. 21 Apr 54, 55p. Rept. no. EES-070140A.
Order from LC mi$3.60, ph$9.30 PB 140 832

While none of the additives tested can presently be recommended without reservation for use in Marine Diesel fuel, nine can tentatively be considered satisfactory. Effective Diesel fuel sea water corrosion inhibiting additives are obtainable which do not adversely affect other fuel properties.

Aeronautical Engineering

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
VIBRATIONS IN HELICOPTERS: TRAINING CONSIDERATIONS, by Robert J. Randle, Jr. Rept. on Human Factors in the Design of Operator Trainers. Mar 59, 10p. WADC Technical note 59-61; AD-212 314.
Order from OTS $0.50 PB 151 824

Helicopter instructor pilots were interviewed individually to analyze in detail the role that vibrations play in piloting helicopters. Information was gathered which indicated that vibrations are utilized as cues in both normal control and the detection and diagnosis of system malfunctions. Training considerations are discussed and recommendations made for a relatively gross simulation of each of the several classes of vibrations in a proposed helicopter instrument trainer.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE USE OF BOTH PITCH-RATE AND NORMAL ACCELERATION FEEDBACK IN ADAPTIVE CONTROL SYSTEMS FOR AIRCRAFT, by Donald D. Moss. Master's thesis. Mar 59, 58p. 11 refs. GGC-59-5.
Order from LC mi$3.60, ph$9.30 PB 140 733

The complexity of designing control systems for high performance aircraft has led to the development of adaptive controls, which attempt to provide an optimum response for a system under any conditions without the use of programmed or external data. A pitch-rate control system with a model-reference feedback and fixed gain offers some improvement over a fixed gain system. Use of a model-reference in the feedback of a normal-acceleration control system is ineffective because the maximum static loop sensitivity is very low. Normal acceleration feedback when added to the pitch-rate model system slightly improves the response but increases the static loop sensitivity.

Bell Aircraft Corp., Buffalo, N. Y.
A STUDY OF CREEP, CREEP-FATIGUE, AND THERMAL-STRESS-FATIGUE IN AIRFRAMES SUBJECT TO AERODYNAMIC HEATING, by Joseph Padlog and Arthur Schnitt. Rept. on Research on Multiweb Structures at Elevated Temperatures, Contract AF 33(616)5247. July 58, 234p. 102 refs. WADC Technical rept. 58-294; AD-211 651.
Order from OTS $3.50 PB 151 826

Methods for predicting creep deformation, creep-rupture, creep-fatigue, and creep-buckling under intermittent or cyclic stressing and temperature conditions are examined. Employing minimum-weight design principles, a procedure is formulated for the determination of optimum design curves for multiweb structures when creep-buckling of the compression cover is the predominant mode of failure. Using the limited amount of available data, failure by creep-fatigue, although a design factor at all temperatures and in particular in the presence of a notch, was found to be less critical at elevated temperatures owing to the increasing predominance of creep-rupture. Thus, at the high temperatures, the effect of small alternating stresses on the mean stress strength may be neglected for certain materials. The order of magnitude of permissible creep deformations for wings is determined from a proposed over-all creep deformation criteria. The various mechanisms leading to thermal-stress-fatigue are discussed, and a criteria for the prediction of this

phenomenon, based on the existence of plastic strain reversals, is presented.

Bolt, Beranek and Newman, Inc., Cambridge, Mass.
METHODS OF FLIGHT VEHICLE NOISE PREDICTION, by Peter A. Franken, Edward M. Kerwin, Jr. and others. Rept. on Dynamics Problems in Flight Vehicles, Contract AF 33(616)5274. Nov 58, 191p. 11 refs. WADC Technical rept. 58-343 AD-205 776.
Order from OTS $3.00 PB 151 827

Procedures are presented for estimating sound pressure levels on or within a flight vehicle. This report is for use by the engineer to make noise estimates during the design stages. The procedures are expressed in general terms which may be obtained long before flight testing. The first steps in the procedure are the estimation of exterior noise levels considering noise sources and the effect of forward speed and altitude. Next the noise transmitting properties of panel, the effect of coincidences, resonances, damping, etc. are included. Finally vehicle geometry is combined with known properties and appropriate corrections to yield interior noise. Several examples are worked out to illustrate the application of the procedures to typical configuration.

Educational Research Corp. [Cambridge, Mass.]
FLIGHT INFORMATION DISPLAYS FOR INSTRUCTIONAL CONSOLES, by Robert Fromer and Milton W. Horowitz. Chap. 1 of the Handbook of Instructor Station Design. Rept. on Contract N61339-74, 22 Sep 58, 85p. 57 refs. Technical rept. NAVTRADEVCEN-20-08-31-1.
Order from LC mi$4.80, ph$13.80 PB 139 514

Two general methods were used in this study. The first method included an examination of all relevant literature that could be discovered and obtained on instruments currently used, or of similar design to those currently used, in Navy Flight Simulator Instructor Stations. The second method of investigation involved extended collaboration with informed personnel.

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
THE EFFECTS OF BLUNT LEADING EDGES ON DELTA WINGS AT MACH 5.8, by Kenneth F. Nicholson. Rept. on Hypersonic Research Project, Contract DA 04-495-ORD-19. 10 June 58, 87p. 16 refs. Memo. 45.
Order from LC mi$4.80, ph$13.80 PB 137 180

Pressure distributions were measured on a series of four delta wings with subsonic and supersonic leading edges, both sharp and blunt. The blunt leading edge radius was about 0.5 per cent of root chord. Schlieren studies were also made to determine top and side view shock locations. The tests were conducted at a nominal Mach number of 5.8, and at Reynolds numbers between 0.335×10^6 and 0.901×10^6 based on root chord. Angular settings covered a range $-0.2 \leqq w/V \leqq 0.5$ in pitch at zero yaw (about $-11.5^\circ \leqq \alpha \leqq +30^\circ$), and a range of $v/V = \pm 0.125$ (about $\pm 7.2^\circ$) at a fixed angle of pitch of 11.5°. The effects of bluntness were found to be small. Also, the pressures produced by shock wave interactions with the boundary layer, and the inviscid pressures generated by the blunt leading edges, were found to be small compared with the inviscid pressures producing lift on the basic wing. Spanwise pressure distributions show no similarity to those obtained by linearized theory. Centerline lower surface pressure in pitch at zero yaw is bracketed between the Newtonian value $\Delta P/q = 2(w/V)^2$ and the two-dimensional exact value.

Minneapolis-Honeywell Regulator Co., Minn.
STUDY TO DETERMINE AN AUTOMATIC FLIGHT CONTROL CONFIGURATION TO PROVIDE A STABILITY AUGMENTATION CAPABILITY FOR HIGH-PERFORMANCE SUPERSONIC AIRCRAFT, by J. T. Van Meter and R. C. McLane. Interim progress rept. for 1 Mar-31 May 57 on Contract AF 33(616)5039. 14 June 57, 60p. 8 refs. MH Aero rept. 48312-QRI; WADC Technical rept. 57-349; AD-156 145.
Order from LC mi$3.60, ph$9.30 PB 140 957

This report summarizes the progress during the first quarter of the contract period. The three areas of work activity are: the inertial coupling investigation, the multi-mode control system study, and the study of special feedback techniques. In the first area, a study of phase and amplitude effects in coupled motions has begun. Consideration of force-free and inertia-free motions as limiting cases has suggested design objectives for automatic control equipment. The multi-mode study has been applied to second- and third-order systems. Results of computer analyses are compiled in normalized plots. Efforts to modify the original multi-mode system to make it adaptive have been encouraging. Very small following error to system parameter change with flight condition has been achieved with proper switching criteria. The study of special feedback techniques as a possible adaptive system is a coordinated effort with the University of Minnesota. Typical aircraft parameter variations have been plotted to indicate the relations between the uncompensated singularities and gain. Restrictions on the choice of network singularities are defined with consideration for the desired shaping of the system root loci to minimize effects of varying flight condition.

Naval Air Test Center, Patuxent River, Md.
NAVY EVALUATION OF USAF "IMPROVED COCKPIT INSTRUMENTATION". Rept. no. 1 (Final) on Proj. TED NO. PTR AE-73105. 22 Apr 58, 15p. 3 refs. Serial ST312-97.
Order from LC mi$2.40, ph$3.30 PB 140 854

This is a report covering the evaluation by the Naval Air Test Center of the USAF "Improved Cockpit Instrumentation" installed in an F102A airplane. Altimeter flyability, reflections, instrument reliability and angle of attack instrument performance are unacceptable. The moving tape presentation did not make instrument flying less difficult but provided a means of presenting data link command information to the pilot. Recommendations are made for further evaluation by the Navy to provide a back-up instrument system to present instrument planning.

North American Aviation, Inc., Los Angeles, Calif.
CRITERIA FOR DESIGN AND ANALYSIS OF HIGH-PERFORMANCE HYDRAULIC CONTROL SYSTEMS, by E. A. Housel. Final rept. on Contract AF 18(600)150. Oct 53, 174p. 12 refs. WADC Technical rept. 53-127; AD-101 755.
Order from LC mi$8.10, ph$27.30 PB 137 300

Theoretical and experimental studies were made to determine the effects of numerous parameters on the mechanical impedance of pulley-cable configurations bearings, and O-ring configurations. Since certain of the basic constants might be calculated conveniently from existing data and formulae, the experimental investigation was directed toward the establishment of criteria on mechanical damping constants.

Polytechnic Inst. of Brooklyn, N. Y.
FLEXURAL VIBRATIONS OF ELASTIC SANDWICH PLATES, by Yi-Yuan Yu. Technical note no. 3 on Contract AF 49(638)453. Mar 59, 34p. 7 refs. AFOSR TN-59-188; AD-211 219.
Order from LC mi$3.00, ph$6.30 PB 140 933

On the basis of the new flexural theory of elastic sandwich plates developed in two previous papers, [1, 2] which includes the effects of rotatory inertia and shear in the core and faces of the sandwich, and on the basis of the exact elasticity theory, flexural vibrations of infinite sandwich plates in plane strain are investigated.

Radio Corp. of America, Camden, N. J.
PRELIMINARY INVESTIGATION OF HYPER ENVIRONMENTS AND METHODS OF SIMULATION. PART II: SIMULATION METHOD, by J. J. Lamb and R. A. Ditaranto. Rept. for 15 Mar 57-15 Jan 58 on Contract AF 33(616)3915. Nov 57, 89p. 122 refs. WADC Technical rept. 57-456. pt. 2; AD-142 167.
Order from LC mi$4.80, ph$13.80 PB 140 956

The report deals mainly with the problem of simulating the environments and combinations of environments discussed in Part 1 of this report. Only those environments which would be detrimental to the operational characteristics of subsystems and equipments used in U. S. Air Force weapon systems were considered for simulation. These environments are: high vacuum, temperature, air cooling, solar radiation, vibration, acoustic excitation, shock, acceleration, high-speed particles, explosive decompression, zero gravity, ozone, ionization, and re-entry environment. Combinations of these environments were also considered for simulation. For each environment present simulation methods and current developments are discussed. Finally a method of simulation is proposed. If the actual environment could not be simulated an attempt was made to simulate the effects of an environment. Where neither simulation of the environment nor its effect is possible a discussion of the limitations involved is presented and/or an area for future investigation is indicated. Included also in this report are discussions of the measurement techniques and equipment to be used for each simulation method. A technique for recording all the resultant data is also suggested and outlined in a section of this report.

Chemical Engineering

Bureau of Ships, Washington, D. C.
STATISTICAL PLAN FOR CO_2 SCRUBBER, by A. Lieberman and B. S. Orleans. 30 Jan 58, 7p. 1 ref. Rept. no. 310B-1(88).
Order from LC mi$1.80, ph$1.80 PB 139 515

The object was to determine setting on CO_2 Scrubber which will remove maximum CO_2 and to determine the variation of CO_2 removal with heating rate, stripping rate and per cent CO_2 incoming.

Office of Technical Services, Washington, D. C.
CHEMICAL PRODUCTS AND PROCESSES: GOVERNMENT-OWNED INVENTIONS AVAILABLE FOR LICENSE ACCUMULATED JULY 1955 THROUGH JUNE 1958. [1959] 16p. Patent Abstract Series no. 2, suppl. no. 2.
Order from OTS $0.50 PB 151 507

Supplements PB 111 465, Dec 53, and PB 111 854, Jan 54-June 55.

For each invention the title of the invention, the United States Patent number, the name of the inventor, the name of the Government agency administering the patent, and an abstract of the patent on the invention are given. Evaluation of the invention with respect to its industrial application is facilitated by an examination of the technical data contained in the abstract.

Quartermaster Research and Engineering Command, Natick, Mass.
PILOT PLANT SCALE INVESTIGATION OF PHORESIN III, by James R. Costello, Thornton P. Traise, and Harold E. Sorstokke (Victor Chemical Works) Nov 58, 19p. 1 ref. Textile Series rept. 103.
Order from LC mi$2.40, ph$3.30 PB 139 587

Phoresin III (dialloxyphosphonopropionitrile) is a flame retardant finish for cotton fabrics. Several plant scale preparations of this compound are described. Each preparation was applied to a cotton combat clothing fabric both on a laboratory scale and in a textile plant. Although a uniform flame retardant was prepared in pilot plant quantities, a satisfactory fabric was not produced in the textile plant applications.

Civil Engineering

Army Chemical Warfare Labs., Army Chemical Center, Md.
DEVELOPMENT OF LIGHTWEIGHT MOBILE COLLECTIVE PROTECTION SYSTEM FOR AACS SHELTERS, by Merton D. Mears. Oct 58, 56p. 5 refs. CWLR-2249.
Order from LC mi$3.60, ph$9.30 PB 139 661

Small airway and air communication system shelters have been designed for the purpose of housing various electronic equipment and operating personnel. These

shelters, for use in the field, are transportable by land and air.

Brown U. Div. of Applied Mathematics, Providence, R. I.
INVERSE DESIGN OF BEAMS AND GRILLAGES, by Jacques Heyman. Technical rept. no. 40 on Contract Nonr-562(10). Aug 58, 27p. 2 refs. C11-40.
Order from LC mi$2.70, ph$4.80 PB 140 761

Parts I and II of the paper deal with elastic design; the ideas are first presented with reference to beams, where the variables are functions of one dimension (the distance along the beam). The general theory is then established for two-dimensional plane grillages, loaded transversely, and two simple examples are worked. Part III of the paper shows that great simplifications can be made if a plastic design is adopted.

Bureau of Yards and Docks, Washington, D. C.
FIRE PREVENTION AND FIRE PROTECTION. 15 Aug 54, changed 7 Sep 55-24 Dec 58. 168p. Technical pub. NAVDOCKS TP-Pu-4; BUDOCKSINST 11320.7 and 11320.7 CH 1-12.
Order from OTS $3.00 PB 151 695

This publication covers various types of fire hazards and describes practices and measures to assist Navy and Marine Corps personnel in solving fire prevention and protection problems at shore activities. The various chapters deal with the broad basic factors for the problem, current standards and Navy policies, basic fire prevention measures, special fire hazards, general storage criteria and measures for interior and exterior fire protection, and special problems of fire prevention and protection during construction.

Bureau of Yards and Docks, Washington, D. C.
SOIL MECHANICS AND EARTH STRUCTURES. 1 Oct 53, 146p. 82 refs. Technical pub. NAVDOCKS TP-Pw-18.
Order from OTS $2.75 PB 151 613

Electrical and Electronic Engineering

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
SPACING OF ON-OFF CONTROLS. II: TOGGLE SWITCHES, by James V. Bradley and Ronald A. Wallis (Antioch Coll.) Rept. on Control Design and Arrangement, Contract AF 33(616)3404. Mar 59, 27p. 2 refs. WADC Technical rept. 58-475; AD-212 270.
Order from OTS $0.75 PB 151 789

Thirty-six right-handed male college students performed a standardized control operation in which the center one of three closely spaced toggle switches was reached to and operated while avoiding manual contact with the adjacent switches. The results suggest that when on-off controls must be crowded into a given amount of panel space, so that they are closer than one inch between centers, performance may be optimized by using miniaturized toggle switches having considerable resistance to operation. Data obtained with toggle switches were compared with those obtained in a previous, similar experiment using push buttons.

Aeronautical Accessories Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
THE EFFICIENCY OF THERMOELECTRIC GENERATORS, by Jose M. Borrego, Henry A. Lyden and John Blair. Rept. on Contract AF 33(616)3984. Sep 58, 81p. 12 refs. WADC Technical note 58-200; AD-206 383.
Order from OTS $2.25 PB 151 748

The thermoelectric effects are described and the efficiency of a thermoelectric generator is developed based upon the assumptions that the thermal conductivity, the electrical resistivity and the Thomson coefficient are constant along the length of the material. This development differs from the usual ones presented in the literature in that the thermoelectric power is not assumed to be constant but instead is assumed to vary with temperature in a manner so that $\tau = T \, da/dT$ is a constant.

Air Force Cambridge Research Center, Bedford, Mass.
RELIABILITY AND MAINTAINABILITY ASSURANCE, by Walton B. Bishop. Nov 58, 17p. 4 refs. AFCRC TN-58-569; AD-160 882.
Order from LC mi$2.40, ph$3.30 PB 139 588

A new philosophy of reliability and maintainability is suggested as a means of assuring that newly-developed military electronic equipment will be reliable and maintainable. This philosophy would shift the burden of detailed reliability specifications concerning component parts from Government to industry, leaving only the specification of functional operation and environment in Government hands. This shift of responsibility necessitates a change in contracting attitude. Contractors must be assumed competent unless proved otherwise. The new philosophy also requires contractors to be responsible for maintenance of equipment for a predetermined period of time so that all defects can be removed and maintenance techniques simplified.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ANNEALING OF RADIATION DAMAGE IN SEMICONDUCTING DEVICES, by Vern E. Bryson. Master's thesis. Mar 59, 50p. 7 refs. GNE-59-2.
Order from LC mi$3.30, ph$7.80 PB 140 729

Experiments to determine the effects of radiation upon silicon carbide diodes. When a voltage was applied to the diode in either forward or back direction, this appears to remove all accumulation of radiation effects of a permanent nature. After 1.18×10^{16} nvt integrated dose, the diodes tested had a forward to back current ratio of approximately 7400, indicating these devices to be as good as they were at the beginning of the experiment.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
APPLICATION OF PNPN TRIODES TO MAGNETIC CORE MEMORIES, by Aultman Doty. Master's thesis. Mar 59, 46p. 7 refs. GE-59A-3.
Order from LC mi$3.30, ph$7.80 PB 140 728

Magnetic core switching arrays require a large current drive for fast operation. Series driving circuits using tubes or transistors dissipate excessive power. A shunt current pulser using trinistors (PNPN triodes) appears promising as an efficient driver. Trinistors have two states, ON (low impedance) and OFF (high impedance). Base current may be used to trigger the trinistor to either state. The turn-off time depends on base current and collector current. Increasing collector current increases turn-off time, and increasing base current decreases turn-off time. Trinistors, in their present state of development, were found to be unsuitable for use as drivers for magnetic cores.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
DESIGN OF A TRIPLE-COINCIDENCE-GATED SUMMING CIRCUIT, by D. B. Harris. Master's thesis. Mar 59, 86p. 31 refs. GE-59A-5.
Order from LC mi$4.80, ph$13.80 PB 140 730

After an introduction and an outline of the ionization chamber as a source of input to the proposed circuit, the design approach is explained. The functions to be performed by the circuit are defined and components to perform them are selected. This leads to a derivation of generalized transfer functions for high-frequency transistors, an investigation of 2N384 unit capabilities, and to a determination of the requirements for a linear pulse amplifier. A series and-gate circuit employing saturated transistors has been chosen as coincidence circuit. To control this gate a monostable multivibrator is designed. After an integration of the design components, capabilities of passive peak-summing circuit and of diode shunt-gate are experimentally demonstrated.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN EXPERIMENTAL SEMICONDUCTOR-DIODE PARAMETRIC AMPLIFIER AT S-BAND FREQUENCIES, by James Virgil Boone. Master's thesis. Mar 59, 94p. 17 refs. GE-59A-1.
Order from LC mi$5.40, ph$15.30 PB 140 922

A parametric amplifier was constructed which used a 1N263 diode as a non-linear reactance element. The signal frequency was near 2800 Mc and the pumping frequency near 5600 Mc. The amplifier had a high insertion loss but was able to produce a net power gain of 5.5 db. Non-linear power characteristics were displayed which were attributed to the self-biased operation of the diode. This type of amplifier has some inherent advantages over a three-frequency parametric amplifier. The use of a standard diode as a non-linear element shows the possibility of inexpensive experimentation in this field.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE HALL GENERATOR AS AN ANALOG MULTIPLIER, by Francis Harold Miller. Master's thesis. Mar 59, 49p. 9 refs. GE-59A-8.
Order from LC mi$3.30, ph$7.80 PB 140 942

A Hall Multiplier is an electrical device which makes use of the Hall effect to multiply two electrical signals. The device is subject to a large number of errors due to various effects which are inherent to the device. However, the magnitude of these errors can be reduced by applying certain techniques and principles in the construction and operation of the multiplier. Accuracies of 1% of full scale can easily be attained, and it is anticipated that a further study of the error problem will materially improve accuracy.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
INTERMODULATION IN TRAVELING WAVE TUBES, by James Edward Green. Master's thesis. Mar 59, 64p. 4 refs. GE-59A-4.
Order from LC mi$3.90, ph$10.80 PB 140 926

This report refines the conventional MacLaurin's series representation for audio amplifiers to include the frequency sensitivity of microwave devices and uses the condition of linear combinations of input frequencies to predict the response. An apparatus suitable for measuring the frequencies and relative amplitudes from x-band to UHF frequencies is discussed and the procedure used in measuring intermodulation in the X-259 B travelling wave tube is presented. The indications obtained are that terms of the MacLaurin's series up to and including the 15th term are significant in the region of saturation, which presents the possibility that 240 new frequencies were produced in varying amplitudes.

Antenna Lab., Ohio State U. Research Foundation, Columbus.
AN ELEMENTARY RADARVISION SYSTEM, by W. C. Davis and R. W. Masters. Rept. on Research on Antennas for Aircraft and Missiles, Contract AF 33(616)3353. 1 Apr 57, 11p. 2 refs. Rept. 667-26; AD-142 487.
Order from LC mi$2.40, ph$3.30 PB 140 960

An elementary radarvision system has been constructed which demonstrates the feasibility of instantaneously scanning radar systems.

Antenna Lab., Ohio State Research Foundation, Columbus.
POLARIZATION DEPENDENCE OF RADAR ECHOES Final engineering rept. for 1 Oct 54-31 Dec 56 on Contract AF 30(635)2811. 1 Jan 57, 14p. 18 refs. Rept. 612-16; RADC TR-57-48; AD-114 324.
Order from LC mi$2.40, ph$3.30 PB 137 292

This research has included work on indoor echo-area measuring techniques, corner reflectors for use with circularly polarized radars, reflectors for radars using MTI, the theory and design of antennas as reflectors, the polarization properties of rain at X-band, and beam-direction indicator systems for traveling-wave antennas.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
CATHODE RAY BEAM CONTROL CIRCUIT, by Morris Halio. July 56, 12p. Memo. rept. 1024.
Order from LC mi$2.40, ph$3.30 PB 139 607

A circuit is described which can be used to control the beam of a cathode ray oscilloscope when recording two separate phenomena on the X and Y axes. The beam, which is normally suppressed is brightened for the duration of the phenomenon. Also, one-microsecond timing blanks on the trace are produced by a crystal controlled generator-shaper. This circuit can be used with any oscilloscope having a Z-axis input.

Bartol Research Foundation, Franklin Inst., Swarthmore, Pa.
RESEARCH INVESTIGATION OF CATHODE EMISSIVE MATERIALS, by J. H. Bloom. Scientific rept. no. 1 on Contract AF 19(604)3904. 15 July 58, 33p. AFCRC-TN-58-196; AD-152 453.
Order from LC mi$3.00, ph$6.30 PB 137 001

Development of apparatus and techniques for fabricating cathodes and experimental diodes under better controlled conditions, with respect to (1) consistency of the matrix, (2) freedom from contamination, and (3) monitoring the quantity of thorium in the cathode. Rate of evaporation of thorium from a thin film on tungsten. Desorption of thorium by electron bombardment.

Bartol Research Foundation, Franklin Inst., Swarthmore, Pa.
RESEARCH INVESTIGATION OF CATHODE EMISSIVE MATERIALS. Scientific rept. no. 3 on Contract AF 19(604)3904. 15 Jan 59, 33p. 3 refs. AFCRC TN-59-116; AD-209 521.
Order from LC mi$3.00, ph$6.30 PB 139 673

Fabrication and emission and life testing of thorium impregnated matrix cathodes has continued. Results of life tests indicate that several thousand hours of useful life are reliably obtained at the 1 amp[cm^2 d. c. level. The evaporation of thorium from the two noncarburized matrix cathodes has been monitored during life. The binding of thorium on the tungsten surface due to polarization of the thorium in local fields has been computed.

Battelle Memorial Inst., Columbus, Ohio.
COMPONENT EVALUATION AND SPECIFICATION ENGINEERING TEST DATA ON TASK XV. RESISTORS, VARIABLE SUBMINIATURE. VOL. II OF II. Data taken July 54-May 55, Contract DA 36-039-sc-63136. [1955] 143p. AD-114 861.
Order from LC mi$7.20, ph$22.80 PB 137 079

Battelle Memorial Inst., Columbus, Ohio.
COMPONENT EVALUATION AND SPECIFICATION ENGINEERING FINAL REPORT ON TASK XVIII. HIGH-FREQUENCY VIBRATION AND SHOCK TESTING ON FIXED, POWER, WIRE-WOUND RESISTORS, by E. G. Lebre, Jr. and P. G. Perry. Rept. on Contract DA 36-039-sc-63136. 15 Feb 55, 71p. AD-96 364.
Order from LC mi$4.50, ph$12.30 PB 137 080

Studies were conducted to determine the effects of HF (55 to 2000 c with a 10-g constant-peak acceleration) and LF vibration (10 to 55 c with a 0.03-in. amplitude), mechanical shock (30 impacts at a 50-g peak acceleration), and constant acceleration (50 g for 5 sec) on the mechanical and electrical properties of fixed-power wire-wound resistors. The following categories of specimens were studied: (1) cylindrical body with lug terminals and brackets for mounting; (2) elliptical body with lug terminals and brackets; (3) cylindrical body with axial terminal leads; (4) cylindrical body with axial lug terminals and a band at each end; and (5) cylindrical body with axial terminal leads and one band at the center. Results showed that only 2 mechanical and 3 electrical failures occurred in 147 specimens as a result of LF vibration. Two electrical and 24 mechanical failures in 144 specimens occurred as a result of HF vibrations. Mechanical-shock forces caused 2 electrical and no mechanical failures in 137 specimens. Constant-acceleration forces caused 1 mechanical and 4 electrical failures in 140 specimens. No transient electrical comditions were observed during stressing of the specimens. Measured electrical-resistance changes were less than 0.2%. HF vibration was the most damaging of the stresses.

Battelle Memorial Inst., Columbus, Ohio.
COMPONENT EVALUATION AND SPECIFICATION ENGINEERING FINAL REPORT ON TASK XXVIII. POWER RESISTOR MOUNTING HARDWARE, by L. H. Stember, Jr. and P. G. Perry. Rept. on Contract DA 36-039-sc-63136. June 56, 47p. AD-115 647.
Order from LC mi $3.30, ph$7.80 PB 137 081

Mountings for the twelve resistor styles under investigation were divided into three groups, each with similar resistor-tube diameters. Three hundred ceramic washers for all three groups were procured, with associated L-brackets, through-bolts, nuts, locking washers, and resistors. Only two manufacturers (AG and D) of the seven included could provide the type with the ceramic insulating washers. The investigations consisted of the following: mounting torque, temperature cycling, thermal shock, moisture-resistance cycling, and high-temperature exposure. The D ceramic insulating washers, being smaller in size than those from Manufacturer AQ, showed up the weaker, breaking at lower values of mounting torque and failing during temperature cycling, thermal shock, and high-temper ature exposure. The brackets and bolts from both manufacturers corroded extensively when exposed to moisture-resistance tests. A standard set of mounting hardware was suggested, separated as before into three groups of similar resistor styles. A sequence of tests was also suggested for future qualification of the hardware.

Bell Telephone Labs., Inc., New York.
ENGINEERING SERVICES ON TRANSISTORS, by R. J. Archer, H. H. Loar and others. Interim technical rept. no. 13, 1 Apr-30 June 58, on Contract DA 36-039-sc-64618. 15 July 58, 71p. 8 refs.
Order from LC mi$4.50, ph$12.30 PB 139 660

Contents:
Optical measurement of vapor adsorption on silicon
Microwave transistor
Status of M2090 transistor

Boron diffusion by means of a boron trichloride source
Structure-determined gain-band product of junction triode transistors
Transistor test methods
High-frequency P-N junction variable capacitors

Bliley Electric Co., Erie, Pa.
DEVELOPMENT OF HIGH TEMPERATURE-LOW FREQUENCY CRYSTAL UNITS: + 125°C PHASE, by J. M. Wolfskill and R. H. Tuznik. Final engineering rept. on Contract NObsr-72532. July 58, 67p.
Order from LC mi$3.90, ph$10.80 PB 140 852

Units which have a frequency tolerance of ± 0.002% at + 125°C and hold ± 0.0025% from + 120°C to + 130°C are presented, and units in the same frequency range which can hold ±0.015% frequency tolerance over the extended operating range −40°C to +125°C are also presented. Both types incorporate a new mounting method, which involves drilling the quartz elements at nodal points, inserting sapphire supporting rods through the holes, and fusing special glass beads to the rods where they pass through the quartz.

Bureau of Ships, Washington, D. C.
STATISTICAL PLAN FOR THE TRANSISTOR INTER-LABORATORY EXPERIMENT, by A. Lieberman. 13 Sep 57, 11p. Rept. no. 310B-7(56).
Order from LC mi$2.40, ph$3.30 PB 139 516

The object was to determine if the three laboratories participating in this test agreed substantially with respect to their mean level of six test parameters and to determine the within and between day measurement variances of the three laboratories.

CBS-Hytron [Danvers, Mass.]
RESEARCH AND DEVELOPMENT "ALPHA - GREATER - THAN - ONE" SILICON DEVICES. Final rept. for Aug 57-Mar 58. Contract AF 19(604)1932. Aug 58, 27p. AFCRC TR-58-179; AD-152 387.
Order from LC mi$2.70, ph$4.80 PB 137 062

A proposal for achieving a negative resistance diode structure based on point contact transistor action. A major portion of the work has concerned itself with evolving techniques for attaining the desired electrical characteristics for emitter and collector. Modification of the collector space charge field has resulted, in no case, in current multiplication.

Cruft Lab., Harvard U., Cambridge, Mass.
BACK-SCATTERING CROSS SECTION OF REACTIVELY LOADED CYLINDRICAL ANTENNAS, by B. -O. As and H. J. Schmitt. Scientific rept. no. 18 on Contract AF 19(604)786. 15 Aug 58, 46p. 9 refs. AFCRC TN-58-365; AD-160 809.
Order from LC mi$3.30, ph$7.80 PB 137 261

An investigation has been made of the possibilities of reducing the back-scattering cross section of thin cylindrical objects by means of reactive loading at different points along its axis. Measurements of the back-scattering cross section of cylindrical antennas loaded by a reactance have been performed on a ground screen at a frequency of 2000 Mc/s. The variational solution for the back-scattering from thin wire antennas by Tai has been generalized to include antennas center-loaded with an arbitrary impedance. The results of this theory are compared with experimental data. Further measurements are reported with multiple reactive loading of the scattering antenna.

Diamond Ordnance Fuze Labs., Washington, D. C.
PROPERTIES OF FERRITES AND THEIR APPLICATIONS TO MICROWAVE SYSTEMS, by F. Reggia and R. D. Hatcher. 20 Feb 59, 59p. 21 refs. TR-674.
Order from OTS $1.50 PB 151 749

This paper summarizes the ferrite development program at the Diamond Ordnance Fuze Laboratories (DOFL). A brief discussion of the fundamentals of magnetic materials and the results of the theory as related to ferrites are included to give the electronic design engineer a better understanding of the functions of ferrites in microwave systems. A number of significant ferrite components developed at DOFL are described and the experimental results obtained are given to illustrate applications of the theory and to provide basic design data for microwave-systems engineers.

Dunlap and Associates, Inc., Stamford, Conn.
ROUTE FINDING AND SWITCHING PROBLEMS IN A FIELD ARMY TELEPHONE COMMUNICATIONS SYSTEM, by John D. Coakley, William C. Abbott and Edward W. Bishop. Rept. on Contract DA 36-039-sc-64647. Aug 57, 37p. 2 refs. AD-144 504.
Order from LC mi$3.00, ph$6.30 PB 137 198

Contents:
A grid communications system and its inherent problems
The USASEL porposal for a long-distance dialing system
Analysis of long-distance operator tasks
  Method of analysis
  Evaluation of automation possibilities
  Analysis and description of proposed operating procedures
  Summary of recommendations derived from analysis of long distance operator tasks
A note on the possible application of subscriber long-distance dialing

Eastman Kodak Co., Rochester, N. Y.
BASIC RESEARCH INVESTIGATION FOR AMMONIA VAPOR ACTIVATED BATTERIES, by J. M. Freund and J. B. Schliff. Quarterly progress rept. no. 3, 15 Mar-14 June 58, on Contract DA 36-039-sc-74902. [1958] 25p. 4 refs.
Order from LC mi$2.70, ph$4.80 PB 137 196

Data are given on the effect on vapor pressure of adding $Pb(SCN)_2$ to NH_4SCN solutions in NH_3, and on the density of NH_4NO_3, NH_4SCN, and NH_4Br solutions at -34°C. General observations on the behavior of liquid cells of the $Zn/NH_4SCN/PbO_2$ system are presented, as well as preliminary information of vapor-activated Pb/PbO_2 cells with NH_4SCN, $Mg(SCN)_2$, or NH_4NO_3 electrolytes. Future work is to be concentrated primarily on the testing of cells.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
INVESTIGATION OF MICROWAVE DUPLEXER SWITCHING MECHANISMS, by A. A. Dougal, K. Rose, and S. Takeda. Quarterly progress rept. no. 5, 1 May-31 July 58, on Contract DA 36-039-sc-73150. 15 Aug 58, 38p. 9 refs.
Order from LC mi$3.00, ph$6.30 PB 140 807

A sequence of experiments was performed to determine the free electron removal processes in water vapor, in mixtures of water vapor in helium or argon gases, and in helium or argon gases alone. The significant findings are the following: in mixtures of water vapor and helium or argon gases, the electron loss is principally controlled by the rapid electron-ion recombination with ion derivatives of the water vapor. Microwave research in semiconductors at millimeter wavelengths was continued, microwave transmission measurements were performed through samples of indium antimonide and near-intrinsic germanium (≈30 ohm-cm). There is particular interest in the indium antimonide experiments since electron-hole pair production due to the microwave field was anticipated. However, due to the high electrical conductivity of the indium antimonide, the field intensity inside of the sample is reduced to about 1/10 of its value outside.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
POLE-ZERO SENSITIVITY IN NETWORK FUNCTIONS, by Franklin F. Kuo. Doctoral thesis. Technical note no. 3 on Contract AF 49(638)63. 1 May 58, 84p. 31 refs. AFOSR TN-58-495; AD-158 305.
Order from LC mi$4.80, ph$13.80 PB 137 069

If a network contains a variable parameter x (capacitance, or g_m of a vacuum tube, etc.), the polynomials of the driving-point and transfer functions describing the network have coefficients which are linear functions of x. The roots of the polynomials are also functions of x. Since the locations of the poles and zeros of these network functions are important in both analysis and synthesis of the network, it is desirable to know quantitatively the tendency for a root to vary with the parameter x. A measure of this tendency to vary is provided by the sensitivity function $S = dp/dx$, where p is a root of a polynomial. Properties and theorems pertaining to this sensitivity function are given in this work.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
SYNTHESIS OF ACTIVE NETWORKS WITH NEGATIVE IMPEDANCE CONVERTERS, by Robert T. Chien. Doctoral thesis. Technical note no. 4 on Contract AF 49(638)63. 5 May 58, 66p. 36 refs. AFOSR TN-58-494; AD-158 304.
Order from LC mi$3.90, ph$10.80 PB 137 068

The Linvill configuration is used to synthesize second-order, nonpositive-real, driving-point functions. Synthesis is accomplished by the use of a surplus factor. With the arbitrariness of the surplus factor, one is able to control the driving-point function. The existence of the solution in all cases is demonstrated and the minimum number of elements property of the solution is proved. It is shown that only five elements are required besides the negative impedance converters (NIC). RC networks are used in some cases and RL networks are used in the remaining cases.

Electron Tube and Microwave Lab., California Inst. of Tech., Pasadena.
TRAVELING WAVE COUPLERS FOR LONGITUDINAL BEAM TYPE AMPLIFIERS, by R. W. Gould. Technical rept. no. 8 on Contract Nonr-220(13). Aug 58, 33p. 11 refs.
Order from LC mi$3.00, ph$6.30 PB 140 757

The equations governing traveling wave interaction between an electron beam and a slow wave circuit are formulated in terms of amplitudes of circuit mode and slow and fast space charge modes. The resulting equations are solved to find expressions for the matrix which relates the mode amplitudes at the output of the traveling wave coupler to the mode amplitudes at the input. The properties of this matrix are discussed and numerical values given for Kompfner Dip.

Electronic Communications, Inc., Timonium, Md.
PRECISION PHASING ELEMENT. Interim engineering rept. for 1 Jan-31 Mar 58 on Contract AF 30(602)1776. [1958] 55p. RADC-TN-58-124; AD-148 718.
Order from LC mi$3.60, ph$9.30 PB 137 007

A system for obtaining precision electronically controllable phase shift in the C-Band region is presented. The system utilizes a ferrite element in conjunction with a servo system referenced to a matrix of stable control frequencies. Various ferrite materials and waveguide configurations have been investigated for possible use in this phase shifter. The results of this investigation indicate that at frequencies in the 5 to 6-kMc region 360° phase shift can be attained ir a length of 8 inches with a loss of less than 1 db. An a-c servo system is being constructed to replace the present d-c system. An analysis of this system is presented, and some results of the measurements on the control loop performance are given.

Electronics Research Lab., U. of California, Berkeley.
NOTE ON GROUND ILLUMINATION IN THE NEAR ZONE OF A PARABOLOID REFLECTOR, by S. Silver, A. Olte, and W. Welch. Rept. on Contract Nonr-222(54). 6 May 58, 8p. 1 ref. Series no. 60, Issue no. 202.
Order from LC mi$1.80, ph$1.80 PB 139 647

Measurements were made of near field intensities behind the aperture plane of a paraboloidal antenna, in the principal E- and H-planes. The data indicate how ground illumination may be significant in limiting the performance of a radiotelescope.

Electronics Research Lab., U. of California, Berkeley.
THE ROOT LOCUS DESIGN OF TRANSISTOR

FEEDBACK AMPLIFIERS, by D. O. Pederson and M. S. Ghausi. Rept. on Contract N7onr-29539. 30 Aug 58, 8p. Rept. no. 75; Series no. 60, issue no. 212.
Order from LC mi$1.80, ph$1.80 PB 140 766

General Electric Co., Schenectady, N. Y.
INDUSTRIAL PREPAREDNESS STUDY FOR VOLTAGE TUNABLE MAGNETRON TYPE Z-5118, by D. J. Hodges. Quarterly progress rept. no. 6, 1 Sep-30 Nov 57, on Contract DA 36-039-sc-70278. [1957] 9p.
Order from LC mi$1.80, ph$1.80 PB 137 164

During this report period most of the effort was directed at reducing the effect of backheating in the tube. Backheating is the result of electrons gaining energy by interacting with the RF fields present in the tube, then falling back to the cathode structure. These electrons striking the cathode structure raise the cathode temperature thereby increasing the emission. (See also PB 127 494)

General Electric Microwave Lab., Palo Alto, Calif.
LOW-NOISE, C-BAND TRAVELING-WAVE TUBE, by Fred M. Schumacher, Frederick B. Fank and Chester G. Lob. Rept. on Electronic Component Operational Development, Contract AF 33(600)31761. Apr 58, 46p. 18 refs. WADC Technical rept. 57-595; AD-155 557.
Order from LC mi$3.30, ph$7.80 PB 140 859

The tube developed used a helix for the slow-wave circuit, cavity couplers, coupled helix attenuator, and a low-noise gun utilizing an approximately exponential space charge wave transformer. Tube noise figures as low as 5.6 db at 4.5 kmc and less than 8 db over the band were obtained. Gains on the order of 25 to 30 db with db variation were obtained with the same voltages as were required for optimum noise figures. A study was made which indicated that the noise figure variations obtained experimentally and those calculated using the experimentally determined voltages are in good agreement. However, the noise figure values were not in good agreement indicating that the initial theoretical values assumed at the anode were incorrect.

General Electric Microwave Lab., Palo Alto, Calif.
STUDY AND INVESTIGATION DIRECTED TOWARD DEVELOPMENT OF A DISTRIBUTED AMPLIFIER DEVICE, by Ward A. Harman. Rept. on Electronic Tubes and Transistors, Contract AF 33(600)28748. July 57, 56p. 4 refs. WADC Technical rept. 57-26; AD-130 868.
Order from LC mi$3.60, ph$9.30 PB 140 858

Results clearly indicate that it is possible to build efficient broadband traveling-wave tube amplifiers in the VHF region. Saturated power outputs above 200 watts were observed at beam efficiencies exceeding 40%. Efficient operation was obtained at frequencies ranging from 100 mc to over 300 mc with saturated gains of approximately 20 db. Over-all efficiencies, including magnetic focusing power, were in excess of the plate efficiencies obtained in present conventional distributed amplifiers. A discussion of the design is included in the report. Recommendations are also included for possible further improvement of the present design. Performance characteristics are given in the form of graphs. Photographs and outline drawings are included.

General Electric Research Lab., Schenectady, N. Y.
C. W. MAGNETRON RESEARCH, by D. A. Wilbur and R. B. Nelson. Final rept. for 1 July 46-31 Dec 49 on Contract W36-039-sc-32279. 1 Apr 50, 174p. Report no. RL-341.
Order from LC mi$8.10, ph$27.30 PB 137 249

The results cover the following: (1) comparison of experimental results with various design equations and a set of simplified design equations; discussion of the cause of upper current or diode cut-off and a means for avoiding it; discussion of the cause of minimum current cut-off and pulsing and methods for its reduction; measurements of cathode back-heating and one method for protecting the hot cathode; and various anode structures and their performance; (2) a method for voltage tuning magnetrons; (3) the use of a magnetron as a reactance for frequency modulating another oscillating magnetron; and (4) the use of a magnetron as an amplifier or controlled oscillator thereby permitting stable external frequency control and, therefore, either amplitude or frequency modulation.

Hycon Eastern, Inc., Cambridge, Mass.
FINAL ENGINEERING REPORT, by J. L. Burkhardt, M. S. Cohen, and H. J. Okoomian. Rept. on Contract AF 30(602)1642. 26 Dec 58, 108p. 32 refs. Rept. no. M-644; RADC-TR-59-2; AD-208 291.
Order from LC mi$5.70, ph$16.80 PB 139 508

Experiments with materials Arsenic-doped silicon, electron-irradiated sodium nitrate, and electron-irradiated calcite for two-level solid-state maser use have been performed. The complete paramagnetic resonance spectrometer apparatus is described, including the equipment for performing adiabatic fast passage.

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
LINE POWER SPECTRUM ANALYZER FOR MECHANICAL VIBRATIONS, by Frank Amoroso. Master's thesis. Rept. on Contract AF 04(645)9. May 58, 76p. 18 refs. Rept. no. T-168.
Order from LC mi$4.50, ph$12.30 PB 140 853

Some of the environmental problems in equipment design for military applications are outlined and the need for power spectrum analysis of vibrations shown. Various systems for frequency analysis, including swept filter and fixed filter types, are discussed. An ideal fixed filter system meeting certain necessary specifications on response to simple inputs is proposed. This system is commercially unavailable.

International Resistance Co., Philadelphia, Pa.
INDUSTRIAL PREPAREDNESS STUDY FOR PRECISION, HIGH-STABILITY RESISTORS, by William F. Stark and George Hoopes. Quarterly progress rept.

no. 5, 1 July-30 Sep 57, on Contract DA 36-039-sc-72726. [1957] 35p.
Order from LC mi$3.00, ph$6.30 PB 137 170

During this period the balance of development work was completed with the satisfactory performance of a film for high range units. This has resulted in the finalizing of a production process for resistor manumanufacture. (See also PB 129 920)

International Resistance Co., Philadelphia, Pa.
INDUSTRIAL PREPAREDNESS STUDY FOR PRECISION, HIGH-STABILITY RESISTORS, by William F. Stark and George Hoopes. Quarterly progress rept. no. 6, 1 Oct-31 Dec 57, on Contract DA 36-039-sc-72726. [1957] 24p.
Order from LC mi$2.70, ph$4.80 PB 137 169

During this period, preproduction units in 1/4 and 1/2 watt sizes were put through preproduction tests. Based upon an agreement with Signal Corps, the preproduction testing was in accordance with performance requirements of the projected MIL-R-10509C specification instead of as originally specified in the contract. (See also PB 137 170)

International Resistance Co., Philadelphia, Pa.
INDUSTRIAL PREPAREDNESS STUDY FOR PRECISION, HIGH-STABILITY RESISTORS, by William F. Stark and George Hoopes. Quarterly progress rept. no. 7, 1 Jan-31 Mar 58, on Contract DA 36-039-sc-72726. [1958] 36p.
Order from LC mi$3.00, ph$6.30 PB 137 168

Test data for the 1/4 and 1/2 watt units has been approved, and the pilot production of these units has been started. The 1 watt units have gone through preproduction testing, and the data is now being evaluated. The 1/8 and 2 watt units are being fabricated for preproduction testing. (See also PB 137 169)

[ITT Labs.,] Nutley, N. J.
MINIATURIZED, HIGH-FREQUENCY INDUCTORS FOR AIRBORNE APPLICATIONS, by Edward D. Carey, Marvin L. Sassler and others. Rept. on Improved Electronic Components, Contract AF 33(600)32060. Aug 58, 87p. 3 refs. WADC Technical rept. 57-290; AD-155 794.
Order from OTS $2.25 PB 151 253

An effort has been made to achieve further miniaturization of the helical resonator approach to inductor design for airborne receiver applications by the inclusion of high-permeability magnetic core materials in the low megacycle region of frequency. Also, the use of air-cored helical resonators in the region extending to 1000 mc has been explored. The principal method of attack used in applying the ferrite to the resonator, that of sleeve loading, has been concluded to be unsuccessful. This was due partially to the dielectric properties of presently available ferrites, and partially to the configuration. Some empirical work was done with a toroidal configuration, which seems more promising providing that the ferrite is electrostatically shielded to prevent dielectric losses. It was determined experimentally that the design information for air-cored helical resonators is valid for extrapolation to 1000 mc. Design limits at uhf, temperature compensation, and aperture coupling are discussed.

[ITT] Labs., Nutley, N. J.
SRT ANTENNA TUNING SYSTEM, by F. Altman, R. Altoonian and others. Final rept. for Dec 52-Mar 55, Contract NObsr-52647. Apr 55, 113p. AD-107 378.
Order from LC mi$6.00, ph$18.30 PB 137 096

This report covers the development and design of two types of antenna tuning systems, one in the classification of remote-manual and the other, automatic method of operation.

Mallory Battery Co., Cleveland, Ohio.
INDUSTRIAL PREPAREDNESS STUDY ON MAGNESIUM DRY CELL BATTERIES TYPE BA270/UXM by J. R. Pischel. Quarterly progress rept. nos. 11, 12, 18 Aug 57-17 Feb 58, on Contracts DA 36-039-sc-(66079, 66080). [1958] 27p.
Order from LC mi$2.70, ph$4.80 PB 137 165

Six lots of N cells and three lots of A cells were made. These lots included AZ10A and AZ31A alloy, to test the theory that reactiveness of alloy may cause a drying out of cells and poor service on tropical storage.

Material Lab., New York Naval Shipyard, Brooklyn.
DEVELOPMENT OF AT-150/SRC "TYPE" VHF ANTENNA, by W. Holman. Final rept. 7 Aug 58, 76p. 8 refs. Lab. Project 5315-121.
Order from LC mi$4.50, ph$12.30 PB 139 495

The object was to develop a high frequency dipole antenna to conform to the requirements of Spec MIL-T-17113(SHIPS) dated 25 Jul 1952, Spec MIL-STD-167(SHIPS) dated 20 Dec 1954 and enclosure (2) of BUSHIPS ltr S67/9-12(838) Ser 838-173 of 5 Nov 1956. The antenna was constructed and critically evaluated to compare it with the NT-66095 for Naval use.

Material Lab., New York Naval Shipyard, Brooklyn.
DIELECTRIC STRENGTH OF SILICONE INSULATED CABLES AFTER EXPOSURE TO FLAME AND VIBRATION. Final rept. 23 July 58, 9p. Lab. project 5248-118.
Order from LC mi$1.80, ph$1.80 PB 139 527

A comparison of the dielectric breakdown results of gas flame exposed Class E and Class T insulated cable specimens indicates that the dielectric strength of specimens vibrated for 15 minutes at a frequency of 20 cycles per second and an amplitude of 1/16 inch is not significantly different from the dielectric strength of similar specimens which had not been vibrated.

[Material Lab.] New York Naval Shipyard, Brooklyn.
OVERVOLTAGES; LABORATORY INVESTIGATION OF. Final rept. 31 July 58, 6p. Lab. Project 5588-5.
Order from LC mi$1.80, ph$1.80 PB 139 494

Investigation of overvoltages on 450 volt, 60 cycle, 3 phase power systems for a ferroresonance condition and for switching and forced current zero interruption.

Mellon Inst. of Industrial Research, U. of Pittsburgh, Pa.
HIGH TEMPERATURE PRINTED CIRCUITRY, by G. H. Young, C. H. T. Wilkins and others. Quarterly rept. no. 7, third series, 1 Apr-30 June 58, on Computer Components Fellowship no. 347, Contract AF 19(604)1595. 2 Oct 58, 42p. 8 refs. AFCRC-TN-58-391; AD-160 847.
Order from LC mi$3.30, ph$7.80 PB 137 262

In further studies of screen-printed molybdenum disilicide-type enamel resistor films, several low resistance positive temperature coefficient films displaying excellent resistance characteristics at temperatures up to 400°C have been produced. Air dielectric capacitors fabricated by screen process techniques consisting of a dielectric layer of high purity alumina powder sandwiched between two silver enamel electrodes, has been tested, but behavior with temperature has proved unsatisfactory. High temperature enamel connections made from gold powder and a higher firing glaze were found to be eight times stronger at 600°C than the silver enamel connections previously prepared. The problem of producing a suitable dielectric film for high temperature capacitor formation is discussed. (See also PB 135 871)

Michigan U. Research Inst., Ann Arbor.
MAGNETICALLY SENSITIVE ELECTRICAL RESISTOR MATERIAL, by E. Katz, L. P. Kao and others. Rept. no. 8 Final for 1 May-31 Aug 56 on Contract DA 36-039-sc-52601. Dec 56, 61p. 35 refs. 2136-7-F.
Order from LC mi$3.90, ph$10.80 PB 136 992

The magneto resistance effect, the Hall effect, the Corbino effect, and several other names represent special cases of the galvanomagnetic effect. The components of the electrical-conductivity tensor are expanded in a power series in terms of the powers of the three components of the magnetic field $\underline{B}$, along suitably chosen coordinates. The coefficients of this series expansion are the material constants by means of which the galvanomagnetic effects are completely described. These coefficients are called "brackets." The present report gives the results of bracket measurements of bismuth, between room temperature and -150°C. The method of preparing oriented single crystals of bismuth and the method of measurement are given.

Michigan U. Research Inst., Ann Arbor.
STUDIES IN RADAR CROSS SECTIONS XXVI, FOCK THEORY, by R. F. Goodrich. Scientific rept. no. 3 on Contract AF 19(604)1949. July 58, 57p. 16 refs. 2591-3-T; AFCRC-TN-58-350; AD-160 790.
Order from LC mi$3.60, ph$9.30 PB 137 260

We present an exposition and certain generalizations of recent work on a class of problems in classical electromagnetic theory. Briefly, we indicate the approach as the Fock theory. It is a method of obtaining the field induced by an incident electromagnetic wave on or near the surface of a good conductor. The surface is restricted to be smooth, convex, and of characteristic dimensions which are "large" with respect to the wavelength of the incident radiation.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
INVESTIGATION OF BROADBAND MILLIMETER WAVEGUIDES AND COMPONENTS, by Leo Birenbaum. Final rept. for 1 Mar 56-28 Feb 57 on Contract DA 36-039-sc-71192. 16 May 57, 51p. 18 refs. Rept. R-577-57; PIB-505; AD-143 147.
Order from LC mi$3.60, ph$9.30 PB 137 188

A Goubau wire was modified by separating the dielectric from the wire conductor. Foam beads were used to center the dielectric tube. Attenuation measurements were made for this modified line for the frequency range 3.8-7.2 kmc/sec. by using a resonator method. Theoretical attenuation values were computed, and are included for comparison. The design of a surface wave horn launcher is discussed, and performance data for the horn are presented.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
A SURVEY OF MICROWAVE MEASUREMENT TECHNIQUES, by Anthony B. Giordane. Rept. on Contract AF 30(635)4789, 23 May 56, 58p. 67 refs. Research rept. R-496-56; PIB-426; RADC TN-56-390; AD-97 890.
Order from LC mi$3.60, ph$9.30 PB 140 920

Fundamental methods relating to the measurement of basic microwave quantities such as VSWR, impedance, power, attenuation, frequency, and noise are described as well as multimode measuring techniques. Following a brief introduction to the evolution of microwave theory with stress on modal representations and reflection coefficient concepts, slotted-line techniques involving crystal diode detectors are evaluated for measuring VSWR, wavelength, and impedance under C-W and pulsed excitations. Sources of errors are considered as well as techniques for realizing precision data. Power measuring methods involving thermal and electronic elements known as calorimeters, baretters, thermistors, film bolometers, thermocouples, and crystals are discussed and evaluated. An analysis is made of errors present in measuring pulse power with thermal elements. Coaxial and waveguide cavity resonators for measuring wavelength are described with emphasis on constructional details. Addition topics include direct and indirect procedures for measuring attenuation, calibration of noise sources, multimode measuring techniques, and measurement of network parameters.

Naval Ordnance Lab., Corona, Calif.
CHARACTERISTICS OF PHOTOCONDUCTIVE DETECTORS, by A. J. Cussen. 14 Feb 58, rev. 20 Mar 59. 24p. NOLC rept. 144; NAVORD rept. 4610; AD-151 992.
Order from OTS $0.75 PB 151 728

A description of the basic characteristics of photoconductive detectors is given to aid in the interpreta-

tion of data obtained in photoconductive research and experimentation. Properties described include variation in signal and noise with bias voltage; frequency response; time constant; spectral response; black body sensitivity; temperature dependence; and sensitive contours.

Naval Research Lab., Washington, D. C.
HIGH-CURRENT GRID-CONTROLLED ELECTRON MULTIPLIER TUBE, by G. L. Stambach, W. J. Graham, and T. E. Hanley. Final rept. 1 June 59, 13p. 7 refs. NRL rept. 5317.
Order from OTS $0.50 PB 151 669

A grid-controlled secondary-emission electron multiplier amplifier tube has been designed and built which can deliver an output pulse of five amperes into a load impedance of 100 ohms, with a rise time of less than 10 millimicroseconds and a transit time of less than 20 millimicroseconds. The measured transconductance of the tube is 600,000 μmhos, and it can provide a positive output pulse with a positive grid input. The tube is constructed as a series of concentric cylinders, with the grid and cathode structure of a 6AG7 pentode serving as a controlled emitter source. Outside the last grid, a series of four louvered, concentric dynodes are placed, with the first dynode serving as the missing pentode plate. Outside the last dynode are a screen-mesh collector and a fifth dynode. From the fifth dynode, a solid cylinder, the output pulse is taken. The concentric geometry has several advantages. Space-charge difficulties are decreased because the current gain at each dynode may be kept at a high level without increasing the current density in proportion. Furthermore, the geometry is suited to a coaxial input and output for obtaining optimum rise-time characteristics.

Naval Research Lab., Washington, D. C.
PROTOTYPE MODEL OF AN AUTOMATIC X-BAND MICROWAVE IMPEDANCE RECORDER, by W. F. Gabriel. Final rept. 26 May 59, 34p. 3 refs. NRL rept. 5295.
Order from OTS $1.00 PB 151 557

A prototype model of an automatic X-band microwave impedance recorder has been developed and tested. The design of this unit, manufactured commercially under contract, is based upon an earlier NRL model. The new instrument is neatly packaged in two portable cabinets and, as regards electrical performance, is fast, accurate, broadband, and has a dynamic range of about 40 db. It will accept any impedance which has an X-band waveguide input and will plot either the impedance or admittance upon either a standard or an expanded Smith chart. Amplitude and phase indicators can be located remotely if desired. The "impedance terminals" of the instrument may be located at any desired point and will remain fixed over the band. In addition to impedance measurements, the instrument is particularly well suited to the measurement of dielectric constant, using the shorted-line method. With slight modification of the accessible rf circuit, the instrument may be adapted to the automatic measurement of transmission coefficient. Also, if a suitable field probe and carriage movement are available, the instrument may be adapted to automatic antenna near-field measurements.

Naval Research Lab., Washington, D. C.
SALVAGE OF FLOODED ELECTRICAL EQUIPMENT, by H. R. Baker and P. B. Leach. Interim rept. 16 June 59, 21p. 11 refs. NRL rept. 5316.
Order from OTS $0.75 PB 151 670

The effectiveness of surface-active agents in displacing Navy Special fuel oil from metal surfaces has been demonstrated. Based on this information, a formulation for removing fuel oil from electrical equipment has been developed which is relatively harmless to electrical insulation, less flammable than the fuel oil, free of skin irritants, non-corrosive to metals, and nontoxic to humans. It also retards the rusting of ferrous surfaces that it contacts. This formulation is a four-component system - hydrocarbon solvent, surfactant, penetrant, and water; it was found to be more satisfactory than formulations in which one of the components was eliminated. Electrical equipment which had been submerged in a mixture of Navy Special fuel oil and sea water was effectively salvaged by treatment with the fuel-oil-removal formulation and Spradri, a water-displacing composition developed previously. An integrated procedure is outlined for the recovery of electrical equipment after submersion in sea water contaminated with fuel oil.

Office of Technical Services, Washington, D. C.
ELECTRICAL AND ELECTRONIC APPARATUS: GOVERNMENT-OWNED INVENTIONS AVAILABLE FOR LICENSE ACCUMULATED JULY 1955 THROUGH JUNE 1958. [1959] 74p. Patent Abstract Series no. 5, suppl. no. 2.
Order from OTS $1.75 PB 151 510

Supplements PB 111 468, Dec 53, and PB 111 854, Jan 54-June 55.

For each invention the title of the invention, the United States Patent number, the name of the inventor, the name of the Government agency administering the patent, and an abstract of the patent on the invention are given. Evaluation of the invention with respect to its industrial application is facilitated by an examination of the technical data contained in the abstract.

Oklahoma A. and M. Coll. School of Electrical Engineering, Stillwater.
UNCONVENTIONAL ELECTRICAL POWER SOURCES, by Paul A. McCollum. Rept. on Contract AF 33(616)2237. Sep 56, 112p. 123 refs. WADC Technical rept. 54-409, Pt. 3; AD-123 291.
Order from OTS $2.50 PB 151 726

The theoretical and practical limitations and capabilities of generating electrical power by means other than rotating machinery and conventional batteries are discussed. Data and theory on the oscillating generator utilizing permanent magnet excitation, the variable reluctance oscillating generator, metal thermopiles, semiconductor thermopiles, thin film thermopiles, the fuel cell, p-n junction silicon solar cell, and nuclear converters are presented. Results of laboratory experimentation are presented on the permanent magnet oscillating generator, the variable reluctance generator, metal thermopiles, and the silicon solar cell. Objectives of the study and experimentation

included the determination of efficiency of energy conversion, weight and size per unit power output, range of voltage and current, life and reliability. (See also PB 131 218, 137 089)

Philco Corp., Philadelphia, Pa.
RADAR SET GROUP OA-1148 (XW-1)/FPS-12, by R. Golden. Final engineering rept. on Contract AF 30(602)1522. [1957] 138p. RADC TR-57-173; AD-131 336.
Order from LC mi$6.90, ph$21.30 PB 137 053

A detailed analysis is made of the design of the transistorized circuits leading to the eventual development of an overall experimental equipment. The equipment consists of a Gate Generator which generates the various Radar System triggering and synchronizing pulses. Thirty Range-Velocity Filter Channels which sequentially sample Video target information and suppress the information from very slow or very fast moving targets, a Compressed Video Signal Regenerator which slows down the high speed sampling of the R-V Filter Channels to enable visual presentation to a Plan Position Indicator and a self contained Power Supply which generates the several voltages necessary for equipment operation. An overall evaluation of the equipment is made in the final sections and final recommendations with regard to further improvement is included.

Pritikin, Nathan.
[INDUSTRIAL PREPAREDNESS STUDY] FOR PRECISION HIGH STABILITY RESISTORS, by Nathan Pritikin. Quarterly progress rept. no. 7, 1 Jan-1 Jan-31 Mar 58, on Contracts DA 36-039-sc-(72722, 72723). 17 Apr 58, 18p.
Order from LC mi$2.40, ph$3.30 PB 137 171

Experimental work on developing a process for making glass sandwich resistors.

Radio Corp. of America, Harrison, N. J.
DEVELOPMENT OF A LOW-NOISE L-BAND TRAVELING-WAVE TUDE, by C. L. Cuccia, H. Pratt and others. Final rept. for 5 Nov 56-[28] Feb 58 on Contract AF 19(604)1938. 1 June 58, 74p. 10 refs. AFCRC TR-58-173; AD-160 806.
Order from LC mi$4.50, ph$12.30 PB 139 614

This program called for the accomplishment of three objectives: (1) the development of low-noise, traveling-wave tube with a maximum noise figure of 7 db and a minimum gain of 20 db in the range, 1100 - 1400 mc; (2) a study of the input power-handling capabilities of low-noise, traveling-wave tubes; (3) the design and development of traveling-wave-tube components that would lend themselves to satisfactory focusing and performance in a periodic, permanent-magnet focusing structure.

Radio Corp. of America, Camden, N. J.
EVALUATION OF LIMITATIONS AND APPLICABILITY OF SOLID-STATE AMPLIFIERS AND REMOTE VIEWING SYSTEMS FOR HIGH VOLTAGE FLUOROSCOPY, by Harold E. Haynes. Final rept. on phase 1, Contract DA 36-034-ORD-2663. 10 Aug 58, 62p. 7 refs.
Order from OTS $1.75 PB 151 644

The work can be summarized as follows: (a) The basic physical limitations imposed on attainable detail sensitivity by statistical fluctuation of X-ray photons was studied, (b) Capabilities of the solid-state amplifier in its present state of development were evaluated in this same framework. (c) The minimum requirements for a television remote viewing system, were calculated, (d) Several alternatives to the particular system proposed were considered. (e) Theoretical performance was evaluated. (f) The nature of further development of the solid-state amplifier required in order to permit the performance indicated in (e) was specified.

Raytheon Mfg. Co., Newton, Mass.
INVESTIGATION OF THE CORRELATION OF STANDARD DIODE EMISSION STUDY CONTRACT FINDINGS WITH PRODUCTION TYPE TUBES USING STANDARD PRODUCTION EQUIPMENT, by F. Hill, C. Bardsley and others. Scientific rept. no. 1, 15 Dec 58-15 Mar 59, on Contract AF 19(604)4095. 20 Mar 59, 46p. AFCRC-TN-58-375; AD-160 824.
Order from LC mi$3.30, ph$7.80 PB 140 857

An investigation is being made of the effect of the variable parameters of commercial exhaust procedures upon the reliability of emission capabilities of a commercial vacuum tube (6AH6). A total of sixty two tests have been run upon a commercial exhaust unit. It has been established that variations in machine speed, changes in lighting and induction heating schedules do not show any significant differences in initial electrical testing of 6AH6 vacuum tubes. A condition of cathode coating pitting has been improved by changes in coating weight. A change in induction coil orientation has decreased the temperature differential between the anode and deflector during exhaust. It has also been determined that the evaluation of 6AH6 vacuum tubes cannot be conducted by the use of a cathode resistance bias. The best method for evaluation of tube reliability is by the use of a constant grid bias voltage. It is also noted that all tests at life burning show an initial slump of emission characteristics during the first twenty-four hours of life burning.

RCA Labs. Div., Radio Corp. of America, Princeton, N. J.
DIRECT VIEWING STORAGE TUBE, by Max Knoll and Paul Rudnick. Quarterly progress rept. no. 1, 1 June-31 Aug 49, on Contract W36-039-sc-44532. [1949] 35p.
Order from LC mi$3.00, ph$6.30 PB 137 145

Considerations are given on the feasibility of 3 different types of thermionic direct viewing storage tubes, and on suggested constructions for such tubes. A method is described for measuring the reading storage time constant of insulators as a function of temperature, previous heating and previous electron bombardment.

RCA Labs. Div., Radio Corp. of America, Princeton, N. J.
DIRECT VIEWING STORAGE TUBE, by Max Knoll and Paul Rudnick. Quarterly progress rept. no. 2, 1 Sep-30 Nov 49, on Contract W36-039-sc-44532. [1949] 31p.
Order from LC mi$3.00, ph$6.30 PB 137 148

Measurements of conductivity, secondary emission and second crossover potentials of silica targets as a function of temperature; data and dimensions of the system; experimental characteristics without storage coating; penetration values for the 500 mesh decelerator and storage grid; storage effects with a decelerator grid coated with magnesium fluoride; construction of a demountable, hydrocarbon-free vacuum system for investigation of storage tube elements. (See also PB 137 145)

RCA Labs. Div., Radio Corp. of America, Princeton, N. J.
DIRECT VIEWING STORAGE TUBE, by Max Knoll and Paul Rudnick. Quarterly progress rept. no. 3, 1 Dec 49-28 Feb 50, on Contract W36-039-sc-44532. [1950] 35p.
Order from LC mi$3.00, ph$6.30 PB 137 146

A study was made in a single-gun tube (SK-3) of the effects of input signal amplitude on viewing storage time, and of unwanted erasing effects of positive ions in the tube. A two-beam experimental tube (SK-5) was made with sliding grid G3, and no storage insulator on grid G2, for measurements on current distribution among the grids and on floating equilibrium potentials for G2. (See also PB 137 148)

RCA Labs. Div., Radio Corp. of America, Princeton, N. J.
DIRECT VIEWING STORAGE TUBE, by Max Knoll and Paul Rudnick. Quarterly progress rept. no. 4, 1 Mar-31 May 50, on Contract W36-039-sc-44532. [1950] 48p.
Order from LC mi$3.30, ph$7.80 PB 137 147

Conditions for obtaining storage of halftones are discussed, and the possibility of halftone viewing with the grid controlled virtual cathode system is demonstrated. (See also PB 137 146)

RCA Labs. Div., Radio Corp. of America, Princeton, N. J.
DIRECT VIEWING STORAGE TUBE, by Max Knoll and Paul Rudnick. Quarterly progress rept. no. 5, 1 June-31 Aug 50, on Contract W36-039-sc-44532. [1950] 35p.
Order from LC mi$3.00, ph$6.30 PB 137 149

200-mesh copper storage grids, giving a more negative cutoff voltage than previous grids, have been developed and tested. (See also PB 137 147)

RCA Labs. Div., Radio Corp. of America, Princeton, N. J.
DIRECT VIEWING STORAGE TUBE, by Max Knoll and Paul Rudnick. Quarterly progress rept. no. 6, 1 Sep-30 Nov 50, on Contract W36-039-sc-44532. [1950] 47p.
Order from LC mi$3.30, ph$7.80 PB 137 150

Using the bi-metal stretching technique, storage grids of 33, 55, and 170 holes per linear inch have been mounted and used in tubes. Further development of these grids is outlined. (See also PB 137 149)

RCA Labs. Div., Radio Corp. of America, Princeton, N. J.
DIRECT VIEWING STORAGE TUBE, by Max Knoll, Paul Rudnick, and L. A. Freedman. Quarterly progress rept. no. 7, 1 Dec 50-Feb 51, on Contract W36-039-sc-44532. [1951] 71p.
Order from LC mi$4.50, ph$12.30 PB 137 151

Using the bimetal stretching technique, further developments have been accomplished on super-nickel and copper storage grids with 55, 100, and 170 holes per inch. (See also PB 137 150)

Research Lab. of Physical Electronics, Tufts [U.] Medford, Mass.
AN INVESTIGATION OF THE CHARACTERISTICS OF ELECTROMECHANICAL FILTERS, by C. R. Mingins, L. A. Howard and others. Quarterly rept. no. 4 on Contract DA 36-039-sc-5402. 14 Nov 51, 63p. 2 refs.
Order from LC mi$3.90, ph$10.80 PB 139 599

The study of techniques of design applicable to band-pass filters which have center frequencies in the range from 1 Mc/s to 20 Mc/s has been continued. Further experiments have been carried out on non-homogeneous laminar filters in which cements of varying character have been employed for attaching together the components, and in which the actual bonding areas have been of different size and placed in different positions. Also, after a thorough exploration of the techniques available and the tolerances necessary in making homogeneous laminar filters, it is concluded that these can best be made in separate parts and then joined with adhesives. Tests of filters of this type are reported.

Research Lab. of Physical Electronics, Tufts [U.] Medford, Mass.
AN INVESTIGATION OF THE CHARACTERISTICS OF ELECTROMECHANICAL FILTERS, by C. R. Mingins, A. D. Frost and others. Quarterly rept. no. 5 on Contract DA 36-039-sc-5402. 14 Feb 52, 45p. 3 refs.
Order from LC mi$3.30, ph$7.80 PB 139 598

Studies have continued into the design techniques which apply to band-pass filters with their center frequencies in the range from 1 Mc/s to 20 Mc/s. Investigations have been made as to the most desirable posi-

tions for the cement spots in a non-homogeneous laminar filter. It has been possible to draw conclusions in regard to the placement of these spots with respect to active and inactive surface regions of the crystal plates which are joined. The physical analysis of an electromechanical filter of the laminar type is extended. Most important is the initiation of a program of measurement of equivalent network parameters, in the attempt to ascertain the specific variations brought about by changing any of the several manipulatable factors. The method is first being applied to the single-crystal divided-electrode filter. (See also PB 139 599)

Research Lab. of Physical Electronics, Tufts [U.] Medford, Mass.
AN INVESTIGATION OF THE CHARACTERISTICS OF ELECTROMECHANICAL FILTERS, by C. R. Mingins, A. D. Frost and others. Quarterly rept. no. 6 on Contract DA 36-039-sc-5402. 15 May 52, 35p. 3 refs.
Order from LC mi$3.00, ph$6.30 PB 139 597

Investigations have continued of design techniques applicable to band-pass filters with their center frequencies greater than one megacycle per second. Measurements of the effective network parameters of a single-crystal filter are described. The measurements have been carried out through a series of changes in which a pair of V-grooves in the opposite faces of a plate were successively deepened. This was done for a number of plates. The trend of changes which is set up in the value of each of the parameters for shallow grooves is reversed at a critical groove depth, and from that point the rate of change in the new direction increases rapidly. Further investigations dealing with single-crystal filters with stepped surfaces, and positive identification of the modes of vibration involved are reported. (See also PB 139 598)

Research Lab. of Physical Electronics, Tufts [U.] Medford, Mass.
AN INVESTIGATION OF THE CHARACTERISTICS OF ELECTROMECHANICAL FILTERS, by C. R. Mingins, A. D. Frost and others. Quarterly rept. no. 8 on Contract DA 36-039-sc-5402. 1 Dec 52, 32p. 9 refs.
Order from LC mi$3.00, ph$6.30 PB 139 613

A report is made on the continued study of techniques useful in the design of electromechanical band-pass filters with center frequencies above one megacycle per second. The parameters of the effective network have been measured for a single-crystal filter with a stepped surface intermediate to the previous cases considered. Conclusions are drawn as to comparisons with these cases in various aspects of the problem. The stepped-surface filter offers important possibilities for furnishing band widths in the required range. Experiments are reported dealing with the interference of families of flexural modes with the functioning of filters using the thickness-shear modes.

Research Lab. of Physical Electronics, Tufts [U.] Medford, Mass.
AN INVESTIGATION OF THE CHARACTERISTICS OF ELECTROMECHANICAL FILTERS, by C. R. Mingins, R. W. Perry and others. Quarterly rept. no. 9 on Contract DA 36-039-sc-5402. 1 Mar 53, 24p. 3 refs.
Order from LC mi$2.70, ph$4.80 PB 139 612

Continued study is reported of design techniques for electromechanical band-pass filters which have center frequencies greater than one megacycle per second. In particular, a determined effort is being made to meet a set of target specifications as to band width, discrimination level, insertion loss, and tolerance within the band. A considerable improvement has been obtained by dividing the electrodes into three segments, rather than two, thereby making use of the inherently strong and persistent 1, 3, 1 and 1, 1, 3 thickness-shear modes of vibration. A wider pass band and greater freedom from unwanted responses result. (See also PB 139 613)

Research Lab. of Physical Electronics, Tufts [U.] Medford, Mass.
AN INVESTIGATION OF THE CHARACTERISTICS OF ELECTROMECHANICAL FILTERS, by C. R. Mingins, A. D. Frost and others. Quarterly rept. no. 10 on Contract DA 36-039-sc-5402. 15 May 53, 36p. 6 refs.
Order from LC mi$3.00, ph$6.30 PB 139 611

The techniques which can be employed in the design of electromechanical band-pass filters having center frequencies above one megacycle per second have received further study. More detailed consideration has been given to the electrical network to which such an electromechanical system is equivalent, and refinements and extensions of our original analytical conclusions have resulted. The experimental emphasis has been upon the dual-plate combinations, in order to determine the degree of control which can be exercised through such factors as the plate geometry, the number of plated segments (which governs the particular modes used), and the location and size of the electrode sections. The results of probing experiments have proved most useful in these studies. (See also PB 139 612)

Research Lab. of Physical Electronics, Tufts [U.] Medford, Mass.
AN INVESTIGATION OF THE CHARACTERISTICS OF ELECTROMECHANICAL FILTERS, by C. R. Mingins, A. D. Frost and others. Supplemental rept. for 15 Dec 53-14 Mar 54 on Contract DA 36-039-sc-5402. 23 Apr 54, 18p.
Order from LC mi$2.40, ph$3.30 PB 139 609

This supplementary report is essentially a presentation of data in tabular, graphical, and pictorial forms, and a resume of the methods by which these data were obtained. (See also PB 139 610)

Research Lab. of Physical Electronics, Tufts [U.] Medford, Mass.
AN INVESTIGATION OF THE CHARACTERISTICS OF ELECTROMECHANICAL FILTERS, by C. R. Mingins, A. D. Frost and others. Final rept. on Contract DA 36-039-sc-5402. 10 Feb 54, 70p. 5 refs.
Order from LC mi$3.90, ph$10.80 PB 139 610

This report summarizes the techniques which have been found applicable, within the scope of the contract, to the design of piezoelectric band-pass filters with their center frequencies greater than one megacycle per second. While the most important aspects of the problem are discussed in detail, many others are dealt with more briefly, but in such cases copious references to the more extended discussions of the quarterly progress reports are included. (See also PB 139 611)

Riverside Research Lab., Motorola, Inc., Calif.
COOLING CONSIDERATIONS FOR THE DESIGN OF AIRBORNE ELECTRONIC EQUIPMENT, by Henry Cohan. Rept. on Contract NOas-55-218c. July 56, reprinted Apr 58, 42p. 10 refs.
Order from LC mi$3.30, ph$7.80 PB 140 751

The purpose of this paper is to acquaint the electronic designer with some of the problems concerned with cooling electronic equipment in high-speed aircraft.

Rome Air Development Center, Griffiss AFB, N. Y.
A SIDE LOBE SUPPRESSION TECHNIQUE: THE SETRIN FIX, by Morton Setrin. Dec 58, 22p. RADC TR-58-58-122; AD-202 093.
Order from LC mi$2.70, ph$4.80 PB 139 507

This report describes the "Setrin Fix", a side lobe suppression technique, developed at RADC. Although the technique is applicable to beacon systems in general, the report is limited to its specific application.

Snell, Foster D., Inc., New York.
THEORY OF ELECTROCHEMICAL CELL REACTIONS, VOLUME 5; ELECTROCHEMICAL CELLS WITH ALKALINE ELECTROLYTES, PART 3 (CONT'D) by Philip A. P. Crispino, Lloyd Osipow, and Harry P. Gregor (Polytechnic Inst. of Brooklyn). Rept. on Contract DA 36-039-sc-64595. 30 Apr 57, 137p. 124 refs. AD-147 110.
Order from LC mi$6.90, ph$21.30 PB 139 581

This volume is the fifth in a series studying the application of electrochemical theory to cells and batteries. It is the purpose of this work to place in the hands of those engaged in, or interested in the development of batteries, a compilation of modern chemical and electrochemical theory selected from the point of view of the battery researcher, together with such information as is currently available on the theoretical aspects of the various systems which are in use or which show commercial promise.

Sperry Gyroscope Co., Great Neck, N. Y.
BROADBAND FERRITE DEVICES STUDY PROGRAM, by L. Swern, D. Fleri, and I. Reichlin. Final engineering rept. on Contract AF 19(604)2248. May 58, 62p. 5 refs. Sperry rept. no. 7210-13027; AFCRC TR-58-138; AD-152 392.
Order from LC mi$3.90, ph$10.80 PB 137 063

Basic transmission lines considered were limited to strip transmission line, coaxial line, and ridged waveguide - all of which are inherently broadband. Experimental data were obtained for isolators, circulators (duplexers), and variable power dividers. Theoretical analysis was generally confirmed, and sufficient evidence resulted to suggest that broadband ferrite devices operating at high-peak and high-average power levels could be developed for use in each of the three types of transmission line. Design details and experimental data are described for ferrite devices including isolators, circulators, and variable power dividers. The high-power characteristics of these devices are compared using as a basis the power characteristics of rectangular waveguide.

Stanford Electronics Labs., Stanford U., Calif.
SENSITIVITY OF ACTIVE NETWORKS TO VARIATIONS IN INTERNAL PARAMETERS, by E. M. Davis, Jr. Technical rept. no. 47 on Contract Nonr-225(24). 29 Aug 58, 174p. 25 refs.
Order from LC mi$8.10, ph$27.30 PB 140 881

An important consideration in the design of an amplifier is the extent to which the amplifier's performance can be desensitized to changes in its active elements. In this report the three possible methods of achieving gain constancy despite changes in the parameters of a linear network are described.

Stanford Electronics Labs., Stanford U., Calif.
THE T-308 LOW NOISE X-BAND TWT, by L. D. Buchmiller, R. W. DeGrasse, and G. Wade. Rept. on Contract AF 33(600)27784. 15 Apr 59, 31p. 5 refs. Technical rept. no. 308-3.
Order from LC mi$3.00, ph$6.30 PB 140 745

This report describes the fabrication and performance of a low-noise X-band tube. The design of the low-noise feature of the tube is discussed in a previous report (TR No. 308-2). A series of five tubes was built. The noise figure of the final design is under 10.5 db in the frequency range from 8 to 11.6 kMc/s. The gain is greater than 30 db over the same frequency range. The lowest noise figure measured was 8 db at 8.3 kMc.

Syracuse U. Research Inst., N. Y
ELECTRONIC PROPERTIES OF FERRITES AND THEIR APPLICATION TO MICROWAVE DEVICES, by D. W. Healy, Jr., and R. A. Johnson. Final rept. on Contract AF 30(602)923. 31 Oxt 56, 6p. SURI rept. no. EE279-561OF; RADC TR-57-10; AD-114 232.
Order from LC mi$1.80, ph$1.80 PB 137 279

Interim Report No. 2, Faraday rotation at microwave frequencies in waveguide structures containing ferrites. Interim Report No. 3, analysis of the non-reciprocal reflections expected when a microwave field propagates through a ferrite of finite length in the direction of propagation. Interim Report No. 4, experimental arrangement for measuring the scattering matrices of microwave devices. Interim Report No. 5, development of a microwave circulator as a cascaded arrangement of identical non-reciprocal coupling holes between two rectangular waveguides. (See also PB 122 890)

Syracuse U. Research Inst., N. Y.
STUDY OF NEAR-ZONE FIELDS OF LARGE APERTURE ANTENNAS. PART I: ELECTROMAGNETIC FIELD DETERMINATION FROM A GIVEN FAR FIELD, by Ming-Kuei Hu. Final rept. on Contract AF 30(602)928. Apr 57, 51p. 6 refs. SURI rept. no. EE282-574F1; RADC-TR-57-126A; AD-131 189.
Order from LC mi$3.60, ph$9.30 PB 139 482

Proof is presented that the electromagnetic field, including the near-zone field, is uniquely determined by a given far field. Two methods of computing the electromagnetic field from a given far field are stated: one is based upon 2 scalar functions and their spherical harmonic expansions, and the other is based upon the inverse distance expansions of Debye potentials. By combining the results of this study with the equivalence principle, it may be stated that if the tangential components of both the electric and magnetic fields are given on a closed surface, which encloses all the sources, the electromagnetic field outside the surface can be computed and the radiation field inside the surface can be determined to some extent. The illustrative examples include the cases of an electric current element at any origin, an electric current loop at origin, and any electromagnetic radiating device.

Syracuse U. Research Inst., N. Y.
SYSTEM RELIABILITY STUDIES, by F. M. Reza and S. Jutila. Final engineering rept. 1 May-1 Oct 57 and 1 Aug 30-Nov 58 on Contract AF 30(602)1675. Dec 58, 42p. 1 ref. SURI rept. no. EE393-56121. RADC TR-59-24; AD-210 729.
Order from LC mi$3.30, ph$7.80 PB 139 579

The research under this contract has been concerned with some theoretical studies in the field of Reliability and Probabilistic Networks. The following specific results have been obtained; (1) A proof for the Shannon-Moore Expansion Theorem. (2) A generalization of the above expansion theorem. (3) Certain necessary conditions for realizability of h(p) functions (4) Development of some basic inequalities for h(p) functions. (5) Evaluation of certain upper-bounds for coefficients of reliability functions. (6) Calculations of coefficients of reliability functions for series, parallel and composition of networks. (7) Development of a difference equation for reliability functions.

Technology Instrument Corp., Acton, Mass.
I. P. S. STUDY, by A. Osborn. Quarterly rept. no. 1 on Contract DA 36-039-sc-66088. 7 May 55, 30p.
Order from LC mi$0.70, ph$4.80 PB 137 084

A high temperature storage test of 100 hours at the stated temperature, ± 5°C, was performed on a batch of films to ascertain the performance relative to the I. P. S. specification for high temperature tests, which was deemed the most severe test with respect to aging of the total resistance. Calculations on the resistivites required to meet resistance specifications for the three envelope sizes in the subject contract indicated the range would be 15 to 450 ohms per square. The results of this test are indicated.

Technology Instrument Corp., Acton, Mass.
I. P. S. STUDY, by W. J. MacDonald. Quarterly rept. no. 3 on Contract DA 36-039-sc-66088. 10 Oct 55, 21p.
Order from LC mi$2.70, ph$4.80 PB 137 083

Design of equipment for applying evaporated metal films on quartz in connection with manufacture of potentiometers. (See also PB 137 084)

Technology Instrument Corp., Acton, Mass.
I. P. S. STUDY, by W. J. MacDonald. Quarterly rept. no. 4 on Contract DA 36-039-sc-66088. 10 Jan 56, 30p.
Order from LC mi$2.70, ph$4.80 PB 137 082

This report is divided into three sections. The first deals with equipment and manpower requirements needed in the evaporation step of metal film potentiometer production. The second section deals with the production that can be obtained from vacuum systems of various sizes. The last section deals with current problems in potentiometer assembly and design as affected by environmental testing. Two assembly problems are noted and design problems as they affect vibration and humidity testing are discussed. (See also PB 137 083)

Technology Instrument Corp., Acton, Mass.
INDUSTRIAL PREPAREDNESS STUDY. Quarterly rept. no. 6 on Contract DA 36-039-sc-66088. 10 July 56, 52p.
Order from LC mi$3.60, ph$9.30 PB 137 172

This report is divided into three sections: the first deals with the correcting of linearity of rotary metal films; the second deals with the curing oven that will be used to cure the required 250 units per eight-hour day; the third deals with the multiple fixture that will be used in evaporating the required number of units per eight-hour day. (See also PB 137 082)

Virginia U. Engineering Experiment Station, Charlottesville.
MASER FOCUSER AND NOZZLE STUDY, by C. R. Harris, R. L. Ramey and others. Quarterly progress rept. no. 2, 1 Oct-31 Dec 56, on Contract DA 36-039-sc-73041. 30 Jan 57, 18p. 16 refs.
Order from LC mi$2.40, ph$3.30 PB 140 674

The 2nd interim report on theoretical and experimental study of nozzle and focuser designs for use in molecular beam oscillators. Problems of focuser design are enumerated and a design incorporating a series of discs, like an electron lens is described. Construction of a vacuum test chamber is described. (See also PB 140 652)

Virginia U. Engineering Experiment Station, Charlottesville.
MASER FOCUSER AND NOZZLE STUDY, by R. L. Ramey, K. L. Haynes and others. Quarterly progress rept. no. 4 (Final) for 1 July 56-30 Sep 57 on Contract DA 36-039-sc-73041. 30 Sep 57, 79p. 7 refs. EES-1-58/4-57U.
Order from LC mi$4.50, ph$12.30 PB 140 672

This investigation was devised to study, both theoretically and experimentally, focuser-separators that supply molecules to the cavity of a molecular beam oscillatory. The focuser-separator provides a separation of upper from lower energy molecules (for a given quantum state) and focuses the higher energy molecules into the cavity. The design of a disk focuser is described. An experimental study is made of beam-focusing characteristics of multipole and disk focusers. (See also PB 140 673)

Westinghouse Electric Corp., Baltimore, Md.
EXPERIMENTAL HIGH POWER UHF LINK. Progress rept. no. 14, Dec 56, on Contract AF 30(602)1256. 21 Jan 57, 11p. RADC TN-57-89; AD-114 345.
Order from LC mi$2.40, ph$3.30 PB 137 086

The transmitter was operated throughout the month on a five-day week basis at a nominal power of 7 kw except for the period from December 21 to December 27.

Westinghouse Electric Corp., Baltimore, Md.
EXPERIMENTAL HIGH POWER UHF LINK. Progress rept. no. 15, Jan 57, on Contract AF 39(602)1256. 20 Feb 57, 11p. RADC TN-57-126; AD-114 394.
Order from LC mi$2.40, ph$3.30 PB 137 085

During the first week of this month, bearing stakes were driven into the ground in front of the antenna to serve as points for reference bearing lines for use in making antenna pattern measurements. The original plan was to complete these antenna measurements by January 8, but these tests were not made because of an air leak in the transmission line which was discovered on January 7, at which time the transmitter was shut down to permit an investigation of this leak. The leak was stopped on January 11 after brazing a circumferential crack in the coupling between the transmission line and the antenna feedhorn, and installing new gas barriers in the transmission line. (See also PB 137 086)

Ordnance, Missiles, and Satellite Vehicles

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ERRORS WHICH RESULT IN CALCULATING THE EARTH-ROTATION EFFECT ON A BALLISTIC MISSILE BY ASSUMING INSTANTANEOUS SEA-LEVEL LAUNCH, by Byron Butler Mizell. Master's thesis. Mar 59, 91p. 4 refs. GGC-59-7.
Order from LC mi$5.40, ph$15.30 PB 140 939

An assumption frequently made by ballisticians when calculating the range of a missile is that its entire trajectory coincides with a segment of an ellipse. The validity of this assumption is investigated for optimum trajectories, the launch points being at the intersection of the equator and prime meridian. Hypothetical elliptical trajectories are compared with segmented trajectories that more closely approximate the actual trajectories. Representative short, medium, and long-range missiles are studied at eight azimuth angles of launch. The errors in range are determined for the eight selected headings, and it is found that the elliptical assumption may result in errors as great as two percent of the total range.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PARAMETERS FOR AN AIR TO AIR BEAM RIDER MISSILE, by Charles Edgar Pearce. Master's thesis. 19 Mar 59, 51p. 4 refs. GGC-59-6.
Order from LC mi$3.60, ph$9.30 PB 140 735

This report consists primarily of a solution to an air-to-air beam rider missile problem where the missile is of the boost glide variety. Solutions to this problem are accomplished for various initial launch angles and ranges. Such items as missile turning rate, time of flight and "G" forces experienced by the missile during its flight are obtained and a series of graphs and diagrams providing this information are included. In addition the problem is explained, the kinematic equations of motion are derived and an analog computer block diagram of the solution is included.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PASSIVE DAMPING OF THE TWO-DIMENSIONAL LIBRATIONS OF A DUMBBELL-SHAPED SATELLITE, by James H. Hall and James H. Smith. Master's thesis. Mar 59, 109p. 10 refs. GGC-59-3.
Order from LC mi$5.70, ph$16.80 PB 140 940

It is proposed that a viscous damping action be used to damp the librations about the local vertical of a dumbbell-shaped earth satellite. The point masses are free to move in or out from the center of mass of the dumbbell against the restraints of a simple spring and viscous damper mechanism. The complete equations are solved on a digital computer and the solutions analyzed. The results show that the passive damping action is effective for unperturbed circular orbits. The damping action shows little effect on the librations in an elliptical orbit. No effect could be noticed on the orbit.

[Army] Engineer Research and Development Labs., Fort Belvoir, Va.
REMOVAL OF NERVE GAS GB FROM WATER UNDER COLD-WEATHER CONDITIONS (SALTY DOG VI), by Arthur L. Donahew. 2 Dec 55, declassified 18 Sep 57, 34p. Rept. 1434.
Order from LC mi$3.00, ph$6.30 PB 139 601

Nerve gas GB can be effectively inactivated in water at moderate or warm temperatures by means of alkali hydrolysis. The required dosage is 1 lb of soda ash or calcium hydroxide per 1000 gal of water. Nerve gas GB can be effectively inactivated in cold water by means of superchlorination with high-test calcium hypochlorite. The required dosage is 1.2 lb per 1000 gal of water. After inactivation of the GB, the hypochlorite ion is removed by treatment with activated carbon. The required dosage of carbon is 5 lb per 1000 gal. Water decontaminated by either of the above procedures can be effectively treated with the Corps of Engineers Mobile Water Purification Unit yielding

an effluent water that is non-toxic, potable, and palatable.

Army Radio Frequency Engineering Office, Washington, D. C.
OPTIMUM FREQUENCIES FOR OUTER SPACE COMMUNICATION. July 58, 33p. 19 refs.
Order from OTS $1.00 PB 151 629

This study has been prepared to provide Army frequency officers, engineers and project officers with a general appreciation of the propagation and frequency aspects of space communication as known to date, and to provide a point-of-departure for further study and discussion of this subject. While additional information is developed regularly, this report has been compiled as a preliminary investigation. A further detailed study directed solely to radio propagation aspects is under preparation.

Army Rocket and Guided Missile Agency, Redstone Arsenal, Ala.
RELIABILITY THROUGH SAFETY MARGINS, by Robert Lusser. Oct 58, 22p. 6 refs.
Order from LC mi$2.70, ph$4.80 PB 139 480

To make complex military equipment satisfactorily reliable, present specifications are totally inadequate. It is imperative that generous safety margins between "stresses" and "strengths" be specified, applied, and controlled by the contracting agencies. A Reliability Code, consisting of 21 paragraphs, is formulated to supplement and override existing specifications. This study is an expanded version of an earlier paper "Reliability Specifications for Guided Missiles," by the same author.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
MEASUREMENT OF FREQUENCY RESPONSE OF PRESSURE GAUGES BY A HIGH-PRESSURE SHOCK TUBE TECHNIQUE, by S. P. Pfaff. Nov 58, 20p. 1 ref. Memo. rept. no. 1179.
Order from LC mi$2.40, ph$3.30 PB 139 543

A method is described for the determination of the frequency response of pressure gauges and transducers using a high pressure shock tube technique. The gauges to be tested are subjected to a step shock wave with amplitudes of about 3200 psi followed by a constant pressure for about one millisecond. The shock tube construction is described in some detail. Preliminary test results and photographs of oscilloscope traces illustrating the frequency response of five commonly used pressure gauges and transducers are presented.

Case Inst. of Tech., Cleveland, Ohio.
MEASUREMENT OF LIFT COEFFICIENT ON A TWO-DIMENSIONAL ROTATING CIRCULAR CYLINDER AT SEVERAL ANGLES OF YAW, by P. R. Nachtsheim. Addendum to Final rept. on Contract DA 33-019-ORD-1434. Dec 56, 7p. 1 ref. AD-122 946.
Order from LC mi$1.80, ph$1.80 PB 137 352

(See also PB 135 712)

Dynamic Analysis and Control Lab., Mass. Inst. of Tech., Cambridge.
THE M. I. T. DEPTH CONTROL MECHANISM FOR TORPEDOES, by Thomas C. Searle. Rept. on Contracts NOrd-(11799, 16594). 28 Oct 57, 49p. 6 refs. Rept. no. 110.
Order from LC mi$3.30, ph$7.80 PB 137 350

The development of a device for controlling depth in straight-running torpedoes by use of pitch-rate, depth-rate, and depth information is described. After successful testing of an experimental unit, a prototype unit was designed and constructed. Details of the prototype are discussed.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
EFFECT OF HEAT-RESISTANT ADDITIVES ON PERFORMANCE OF CELLULOSE ACETATE INHIBITORS, by Louis Jablansky. May 59, 11p. Technical rept. 2616; AD-213 899.
Order from LC mi$2.40, ph$3.30 PB 140 936

A preliminary study was conducted to determine whether the addition of heat-resistant materials to cellulose acetate film would provide inhibitor tubes of improved insulating properties. Carbon, magnesium carbonate, titanium dioxide, and aluminum oxide were selected. Cellulose acetate inhibitors containing 5% magnesium carbonate or 2 1/2 to 5% carbon gave the best insulation. The 5%-magnesium-carbonate cellulose acetate inhibitor tubes made it possible to reduce the motor case temperature from 950°F to 500°F.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
ENTHALPY CHANGE, HEAT OF FUSION, AND SPECIFIC HEAT OF BASIC EXPLOSIVES, by Rudolph Velicky, Charles Lenchitz and William Beach. Jan 59, 37p. 7 refs. Technical rept. 2504.
Order from LC mi$3.00, ph$6.30 PB 139 502

An ice calorimeter was used to measure the change in enthalpy of the following compounds: cyclotol, baratol, two military grades of Composition B, military grade TNT and RDX, and recrystallized TNT, HMX, and RDX. Measurements were made between -78°C and 150°C. The specific heat and heat of fusion were derived from the enthalpy measurements. The conventional ice calorimeters were modified by eliminating the stopcock from the apparatus.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
FACTORS AFFECTING MEASUREMENT OF TENSILE PROPERTIES OF DOUBLE-BASE PROPELLANTS by Elsie McAbee. May 59, 34p. 5 refs. Technical rept. 2584; AD-209 062.
Order from LC mi$3.00, ph$6.30 PB 140 937

Initial results of constant strain rate and constant crosshead testing of two cast double-base propellants, OGK and OIO, showed extreme variability in test results not only between testing machines but among specimens obtained from the same propellant grain. This variability was also apparent in the results of creep work.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
LONG RANGE STUDY OF PREDICTION OF SAFE LIFE OF PROPELLANTS, by Norman E. Beach and Norris S. Garman. Jan 59, 30p. 1 ref. Technical memo. no. GL-1-59.
Order from LC mi$2.70, ph$4.80 PB 139 590

This project encompasses various storage-and-testing programs. Single, double and triple-base artillery, double-base mortar, and single-base small arms propellants are involved. Storage is under temperate, tropical, desert and semi-desert conditions; and under controlled elevated temperatures: 122°F., 150°F., and 176°F.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
SENSITIVITY OF EXPLOSIVES TO SETBACK PRESSURE, by Robert W. Heinemann and Robert T. Schimmel. Dec 58, 31p. 7 refs. Technical rept. 2572; AD-202 575.
Order from LC mi$3.00, ph$6.30 PB 139 496

Tests were conducted in the Activator on a laboratory scale to evaluate the critical setback pressures of cast Composition B, 75/25 cyclotol, 60/40 cyclotol, TNT, 70/30 octol, 75/25 octol, HTA-3, HBX-1, HBX-3, H-6, and 80/20 tritonal, and pressed Compositions A-4, MAX-2, and MOX-2B.

Michigan U. Research Inst., Ann Arbor.
AN ELECTROMAGNETIC ACCELERATOR UTILIZING SEQUENTIAL SWITCHING, by D. B. Miller, W. G. Dow, and G. I. Haddad. Final rept. on Contract AF 19(604)1740. Sep 58, 78p. 18 refs. 2522-10-F; AFCRC TR-58-267.
Order from LC mi$4.50, ph$12.30 PB 139 072

The accelerator considered in this report consists of a single-layer electrically conducting solenoid and a metal projectile closely fitting inside or outside the coil. A series of switches delivers or removes current from each solenoid turn in synchronism with the traveling projectile. This produces within the projectile both steady-state and transient magnetic fields which are shown to increase the efficiency over a purely transient system. Both mechanical and thermal limitations are studied.

Naval Ordnance Lab., Corona, Calif.
THE ROLLING BALL AS A PRECISION DISTANCE INTEGRATOR, by Wayne E. Phillips. 2 Mar 59, 27p. NOLC rept. 440; NAVORD rept. 5943.
Order from LC mi$2.70, ph$4.80 PB 140 747

Rocket-propelled missiles commonly require that a particular function be performed at some fixed distance after launch. Since the flight of one missile is not the same as that of the next, due mainly to differences in booster thrust, the chosen distance cannot be established by a timer. Where distance must be established with precision over a wide range of boost accelerations it is common practice to employ some form of distance integrator. There are several forms in use, and each functions by performing a double integration of the missile's acceleration. A new and previously untried device capable of performing the double-integration operation is presented; its characteristics, potential applications, and limitations are discussed.

Naval Propellant Plant, Indian Head, Md.
A CONTINUOUS LOSS-IN-WEIGHT FEEDER FOR NITROCELLULOSE, by C. D. Cox, J. H. Pennington and others. 30 Dec 58, 23p. Memo. rept. no. 157.
Order from LC mi$2.70, ph$4.80 PB 139 500

A continuous loss-in-weight feeder for nitrocellulose has been desgined and built for installation in pilot plant at the U. S. Naval Propellant Plant. This feeder represents a significant advance in the automatic and continuous processing of explosive materials.

Naval Proving Ground, Dahlgren, Va.
AN INVESTIGATION OF HIGH-FREQUENCY FLUCTUATIONS OF STRAIN GAUGE SIGNALS ASSOCIATED WITH THE PRESENCE OF LIQUIDS IN GUNS, by J. Henderson. 25 June 54, declassified 5 Aug 58, 37p. 3 refs. NPG rept. no. 1281.
Order from LC mi$3.00, ph$6.30 PB 139 560

The occurrence of high-frequency oscillations on the pressure and strain oscillograms from guns using liquid propellants or liquid projectiles was investigated by recording the response of gauges under a variety of conditions during scheduled tests of two guns.

Office of Technical Services, Washington, D. C.
ORDNANCE: GOVERNMENT-OWNED INVENTIONS AVAILABLE FOR LICENSE ACCUMULATED JULY 1955 THROUGH JUNE 1958. [1959] 34p. Patent Abstract Series, no. 6, suppl. no. 2.
Order from OTS $0.75 PB 151 511

Supplements PB 111 469, Dec 53, and PB 111 854, Jan 54-June 55.

For each invention the title of the invention, the United States Patent number, the name of the inventor, the name of the Government agency administering the patent, and an abstract of the patent on the invention are given. Evaluation of the invention with respect to its industrial application is facilitated by an examination of the technical data contained in the abstract.

Picatinny Arsenal, Dover, N. J.
MASS PRODUCIBILITY OF M9 MORTAR PROPELLANT, PHASE 1, by John Merten and Francis Handville. Jan 59, 29p. 5 refs. Technical rept. DB-TR: 14-58.
Order from LC mi$2.70, ph$4.80 PB 139 501

Two pilot lots of M9 composition discs (0.010 inch web) were made for the 8 lmm Mortar. Data obtained during the study permitted the establishment of a tentative sequence of operations for local use. A bottleneck operation at the cutter was the most serious problem encountered. Studies were conducted to remedy this condition.

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.

POLYETHYLENE TEREPHTHALATE SEAL FOR THE RECOILLESS RIFLE CARTRIDGE CASE, by G. P. Sollott and L. Berger. Oct 57, 19p. 7 refs. Rept. no. R-1409.
Order from LC mi$2.40, ph$3.30 PB 136 194

Results of ballistic testing indicated that recoilless rifle cartridge cases internally lined with polyethylene terephthalate (PETP) film were functionally satisfactory. Not only was PETP film shown to be nitroglycerin-resistant during accelerated aging with double base propellants, but the liner adhesive bond itself was shown to be unaffected under similar aging conditions. The adhesive bond, furthermore, showed no significant effect on being weather-conditioned prior to testing. In addition, PETP-lined cases were subjected to rough handling and temperature shock cycling tests with satisfactory results, and it was found that both liner and cemented joints remained completely intact when lined cases were subjected to an accelerated long term storage test. Voltage measurements of the electrical charge generated on the PETP liner by tumbling graphite-glazed dummy propellant indicated that the probability is remote that a charge accumulating on the PETP liner would cause a spark in a complete round. It is concluded that an adhesively fastened internal PETP seal is satisfactory for use in recoilless rifle cartridge cases with either single or double base propellants.

Poulter Labs., Stanford Research Inst., Menlo Park, Calif.

FUNDAMENTAL STUDIES OF EXPLOSIVE CHARGES. VOLUME I: STEEL CUTTING CHARGES, by S. A. Moses and G. B. Huber. Final rept. for 1 June 55-31 May 57 on Contract DA 44-009-eng-2512. 15 Apr 57, 77p. AD-140 872.
Order from LC mi$4.50, ph$12.30 PB 137 073

A theory has been presented to explain the manner in which steel is cut by an explosive charge. New and simplified formulas have been developed for the cutting of steel by explosive charges. These formulas require less explosive than is required by the present demolition formulas. Prior to the development of the new formulas, several suggestions were made to simplify the calculations required by the present formulas. Suggestions have been made to change the physical shape of small demolition blocks. Suggestions have been made to change the packaging and shape of TNT demolition blocks. It has been shown that the type of cut formed in steel can be changed by relocating the point of detonation. The thickness of steel that can be cut by the present demolition blocks has been determined. With this information, it is possible to use a simplified procedure for cutting steel, practically eliminating all calculations. A new type charge, a variable-linear shaped charge, has been developed for cutting steel cables which are almost impossible to cut by bulk charges. Additional information has been gained on the mechanism of the diamond charge. A formula has been developed for using this charge on large steel bars.

Poulter Labs., Stanford Research Inst., Menlo Park, Calif.

FUNDAMENTAL STUDIES OF EXPLOSIVE CHARGES. VOLUME II: CONCRETE BREACHING AND WOOD CUTTING CHARGES, by S. A. Moses and G. B. Huber. Final rept. for 1 June 55-31 May 57 on Contract DA 44-009-eng-2512. 12 June 57, 86p. AD-140 871.
Order from LC mi$4.80, ph$13.80 PB 137 074

Additional basic knowledge was gained on the factors involved in the destruction of concrete by explosive charges. The formula for the breaching of concrete walls was modified. Suggestions have been made regarding changes in the shape of demolition charges to increase their effectiveness. Tamped (or earth-covered) charges were studied with special reference to the role of the tamping material. The demolition of concrete beams by pressure charges was investigated. Additional basic knowledge was gained on the factor involved in the cutting of wood by explosive charges. A new technique was suggested for cutting trees and timbers. This technique utilizes less explosive than the usual method and also controls the direction of fall of the trees. (See also PB 137 073)

Watertown Arsenal Labs., Mass.

AN INVESTIGATION OF THE CHARPY V NOTCH IMPACT CHARACTERISTICS OF LEADED CARBON AND ALLOY STEELS, by John W. Lyons. Rept. on Engineering Support for DOD Standardization. July 58, 44p. 16 refs. WAL TR 302/1.
Order from LC mi$3.30, ph$7.80 PB 139 671

Tensile and impact properties of pearlitic, bainitic, and martensitic leaded and non-leaded 1045, 4340, and 4140 2-1/2-inch square steel billets were tested in the transverse and longitudinal directions at hardness levels ranging from R_b 90 to R_c 54. Impact energies and transition temperatures of leaded steels tested in the longitudinal direction may be raised as a result of laminated fractures which are caused by lead inclusions. Impact energies of leaded steels are consistently lower than non-leaded steels when measured in the transverse direction.

FOOD, HANDLING, AND PACKAGING EQUIPMENT

Food

Minnesota Agricultural Experiment Station, St. St. Paul.

THE MECHANISM OF DETERIORATIVE CHANGES IN MILK PRODUCTS, by S. T. Coulter, H. A. Harland and others. Rept. no. 20 (Final) for 1 Oct 52-30 Sep 53 on Contract DA 44-109-qm-1253. [1952] 16p. 12 refs. File no. D-305.
Order from LC mi$2.40, ph$3.30 PB 140 839

Various surface-active agents have been successfully employed to liberate fat from milk and cream. The work reported was undertaken to investigate the possibility of utilizing such an agent to secure butter oil not only from fluid, but also from reconstituted dry milk for the estimation of fat peroxides by the ferric thiocyanate method.

Office of Technical Services, Washington, D. C.
FOOD PRODUCTS AND PROCESSES: GOVERNMENT-OWNED INVENTIONS AVAILABLE FOR LICENSE ACCUMULATED JULY 1955 THROUGH JUNE 1958. [1959] 8p. Patent Abstract Series, no. 3, suppl. no. 2.
Order from OTS $0.50 PB 151 508

Supplements PB 111 466, Dec 53, and PB 111 854, Jan 54-June 55.

For each invention the title of the invention, the United States Patent number, the name of the inventor, the name of the Government agency administering the patent, and an abstract of the patent on the invention are given. Evaluation of the invention with respect to its industrial application is facilitated by an examination of the technical data contained in the abstract.

Oregon State Coll. Agricultural Experiment Station, Corvallis.
DEHYDRATION OF MONTMORENCY CHERRIES, by E. M. Litwiller. Rept. no. 18 (Final) for 2 May 55-30 June 58 on Contract DA 19-129-qm-373 [1958] 5p. File no. F-305.
Order from LC mi$1.80, ph$1.80 PB 140 834

Many lots of cherries were prepared using various pretreatments and drying procedures. Based on the results of these and on their color and flavor acceptance, we can recommend a procedure which will provide dehydrated cherries suitable for pies and cobblers, cherries which can endure high temperature storage at 100°F without serious impairment of quality.

Packaging

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
AN EVALUATION OF SOME HIGH-DENSITY-POLYETHYLENE JARS FOR STORAGE AND SHIPMENT OF SMALL PARTS, by Richard H. DeVore. May 59, 13p. Technical rept. 2621; AD-214 255.
Order from OTS $0.50 PB 151 847

Physical tests were conducted on high-density-polyethylene jars. The tests consisted of rough handling tests (including vibration), determination of water-vapor transmission rate (WVTR), and quick-leak tests. The results indicate that the 2-oz and 4-oz jars would be satisfactory for storing and shipping small parts if protection against physical damage is the only requirement. The 16-oz jars would not be satisfactory. The WVTR values for the jars were very satisfactory when the cover joints were waxed. All the jars failed the quick-leak test, probably because of their large thread tolerances and poor gasket seals.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
PRODUCT ENGINEERING EVALUATION OF ALTERNATIVE MATERIALS, METHODS OF MANUFACTURING OR METHODS OF PACKING (6043-90, 91, 92) by Theodore Fruchtman. Final engineering rept. 16 Feb 59, 9p.
Order from LC mi$1.80, ph$1.80 PB 140 736

Review of Accomplishments to date on 33 subdivisions of R & D.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
PRODUCT ENGINEERING OF MOLDED PAPER SUPPORT (6045-92) by Theodore Fruchtman. Final engineering rept. Mar 59, 8p. 2 refs.
Order from LC mi$1.80, ph$1.80 PB 140 737

After extensive investigation and experiment a successful new type of support was designed, known as Molded Paper Supports for protective overseas shipment of bomb fuzes of irregular shape. They are well illustrated by the photograph in the Appendix.

Joint Military Packaging Course, Rossford Ordnance Depot, Toledo, Ohio.
JOINT MILITARY PACKAGING, PHASE I. PRESERVATION AND INTERMEDIATE PROTECTION. 9-L-F3(I). Apr 58 [407]p. 296 refs.
Order from OTS $6.00 PB 151 324

Contents:
Introduction to preservation and intermediate protection
General departmental packaging policies
Packaging specifications
Cleaning
  Cleaning, C-1 processes
  Cold solvent cleaning and drying procedures
  Vapor degreasing (including process C-18, vapor-degreasing followed by fingerprint removal)
  Alkaline, electro-, emulsion, steam and abrasive cleaning
  Cleaning inspection and tests
Preservatives and their application
  Introduction to preservatives
  Types of preservatives
  Temporary or P-type preservatives
  Selection and application of P-type preservatives
Methods of preservation
  Introduction to methods of preservation
  Cushioning, blocking, bracing and bolting
  Methods III and I
  Heat sealing
  Methods IC, IB, IA, and II
  Strippable films (sprayable)
  Controlled humidity
  Volatile corrosion inhibitors
Economy in packaging
Packaging inspection
  Packaging inspection (MIL-STD-105)
  Packaging inspection (MIL-P-116)

Materials Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
MATERIALS, TECHNIQUES, AND ECONOMICS OF FOAMED-IN-PLACE POLYURETHANE CUSHIONING FOR PACKAGING, by Sidney Childers. Rept. for Jan 57-Feb 58 on Finishes and Materials Preservation. Apr 59, 35p. WADC Technical rept. 58-601; AD-211 913.
Order from OTS $1.00 PB 151 831

This report describes an investigation into various aspects of foaming-in-place molded shapes of polyurethane cushioning material. The chemistry of the foam reactions and the foam systems are described. The aging characteristics of the materials and the effect on metals and humidity indicators of the vapors given off during foaming are discussed. Various facts about foaming methods and equipment are presented. Of the foaming techniques investigated, it was found that completely premolding or a combination of premolding and foaming into the container was the best technique. It was also found that one can create molds by utilization of simple methods and low cost, reusable materials, such as hot melt plastics. The cost of creating the molded shape is shown to be less, in most cases, than the present practise of procuring molded curled hair shapes.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
A STRESS ANALYSIS ON THE INNER GIMBAL DRIVE SHAFT OF THE HUMAN CENTRIFUGE FOR VARIOUS GONDOLA LOADING CONDITIONS, by Richard J. Crosbie. Rept. no. 2 on Proj. NM 11 02 12.6. 12 Feb 59, 24p. 2 refs. NADC-MA-5901.
Order from LC mi$2.70, ph$4.80 PB 140 836

The purpose of this report is to supplement the various technical reports issued by the McKiernan-Terry Corporation for the maximum torque limitation on the inner gimbal drive shaft of the Johnsville human centrifuge. The report defines means of computing limits on unbalanced loading of the gondola for various dynamic conditions. To this extent, theory is checked by experimental results.

Engines and Propulsion Systems

Aerojet-General Corp., Azusa, Calif.
CHEMICAL FRAGMENTS AS ULTRA-ENERGY PROPELLANTS, by W. H. Andersen and G. Moe. Abstracts bulletin no. 1, Contract AF 18(603)110. July 57, 35p. 145 refs. Rept. no. 1284 (Special) AFOSR TN-57-408; AD-132 486.
Order from LC mi$3.00, ph$6.30 PB 137 049

Unclassified literature regarding the research and investigation of highly reactive molecular fragments were abstracted and compiled. The general approach to this literature survey was to abstract pertinent literature and to include abstracts of the most important papers listed only by reference in E. W. R. Steacie's book, Atomic and Free Radical Reactions (ACS monograph no. 125, 1954). Abstracts of the following journals are presented for the period of 1953 through 1956; (1) J. Chem. Phys. 1953 through 1956; (2) J. Phys. Chem., 1953 through 1956; (3) J. Am. Chem. Soc., 1956; (4) J. Appl. Chem., 1956; (5) Trans. Faraday Soc., 1955 and 1956; (6) Proc. Roy. Soc., 1954 through 1956; (7) Phy. Rev., 1956 (8) Chem Rev., 1956; and (9) J. Inor. and Nuclear Chem., 1956. The abstracts are grouped within the following categories: (1) production, (2) identification, (3) stabilization, and (4) properties. Within each category, the abstracts are arranged chronologically by year and are numbered consecutively.

Army Engineer Research and Development Labs., Fort Belvoir, Va.
STARTING OF DIESEL ENGINES AT LOW TEMPERATURES, by John A. Klisch. 10 July 58, 44p. 10 refs. Rept. no. 1534-TR.
Order from OTS $1.25 PB 151 676

This study outlines the existing problems and effectiveness of applied remedies associated with the operation of diesel engines at various low temperatures down to -65°F. Information is based on a study of various research reports pertaining to the subject and on personal acquaintance and association with low-temperature operations. The study concludes that diesel engines can be started and operated at low temperatures down to -65°F, provided correct fuels, proper control of priming fluids, correct lubricants, adequate enclosures, adequate heating and cranking speeds, and properly trained engine operators are furnished.

Army Rocket and Guided Missile Agency, Redstone Arsenal, Ala.
SOLID-PROPELLANT MOTOR RESPONSE TO TEMPERATURE SHOCK, by Ralph D. Doner. 15 Jan 59, 22p. 2 refs. ARGMA rept. 6R13F.
Order from LC mi$2.70, ph$4.80 PB 139 497

Choice of instrumentation, planning of tests, and processing of data in determining the thermal characteristics of solid-propellant rocket motors are discussed and illustrated. Emphasis is placed on the variation of average grain temperature with time, gradients as a function of position and time, and retentivity as a thermal property of the motor, in discussing the effects of gradients on ballistic parameters and the economics of accelerated temperature conditioning.

Plasmadyne Corp., Santa Ana, Calif.
FUNDAMENTAL INVESTIGATION OF ELECTRICAL POWER SOURCES FOR ELECTRIC THRUST DEVICES, by Emil J. Hellund. Rept. on Contract AF 49(638)332. 3 Sep 58, 33p. Technical note no. E-TN088-332; AFOSR TN-58-790; AD-202 223.
Order from LC mi$3.00, ph$6.30 PB 137 154

A survey and classification has been made of various types of power sources which might possibly be used in conjunction with propulsion systems for space vehicles. Codification of these types has been systematically developed with the objective in mind of providing a convenient classification by means of which a rapid evaluation of any "new" proposals can be made. A number of possible new power systems and propulsion systems have been brought out.

Purdue Research Foundation, Lafayette, Ind.
THE ANALYTICAL DETERMINATION OF THE LOCAL HEAT TRANSFER CHARACTERISTICS OF GASES FLOWING TURBULENTLY IN THE THERMAL ENTRANCE REGION OF A CIRCULAR DUCT WITH LARGE TEMPERATURE DIFFERENCES BETWEEN THE GAS AND THE DUCT WALL, by Helmut Wolf and M. J. Zucrow. Rept. on Contracts Nonr-1858(25) and N6ori-105(03). Dec 57, 210p. 53 refs. Proj. Squid Technical rept. PUR-35-M.
Order from LC mi$9.30, ph$31.80 PB 140 849

The mathematical description of flow with heat transfer is presented for a fluid flowing through a circular duct of constant area, under laminar and turbulent flow conditions. A review of the published literature is included that summarizes the analytical work pertinent to the calculation of heat transfer in the entrance region. A calculation of the heat transfer characteristics for air and carbon dioxide in the entrance region has been made employing the boundary layer equations of Eckert that were non-dimensionalized according to the method of Deissler. The calculations were performed for the boundary conditions of constant heat flux (heating the gas), and constant wall temperature (cooling the gas); it was assumed that the velocity profile was fully developed and the temperature profile was uniform at the cross section where energy exchange was initiated.

Manufacturing Equipment and Processes

Armour Research Foundation, Chicago, Ill.
FUNDAMENTALS OF BRAZING, by N. Bredzs and H. Schwartzbart. Sixth year final rept. for 23 June 57-22 June 58 on Contract DA 11-022-ORD-957. 25 Sep 58 [77]p. 27 refs.
Order from OTS $2.00 PB 151 655

Investigation of the role of intermetallic compounds in brazed joints and the torsional properties of brazed joints. Steel was brazed with Ag-Si, Ag-Zn, Ag-Sn, and Cu-Fe-B alloys. It was sought to establish the "critical concentration limit" for the various systems investigated and its dependence on such factors as the free energy of formation of the intermetallic compound, the heat of reaction of this formation, and the partial molar free energies of solution of the element (forming the intermetallic compound) in the liquid filler metal. Torsional properties of silver brazed joints in mild steel and drill rod were investigated using a tubular specimen.

Carnegie Inst. of Tech. Graduate School of Industrial Administration, Pittsburgh, Pa.
CALCULATION OF THE INCOMPLETE GAMMA FUNCTION, SUITABLE FOR ELECTRONIC COMPUTER APPLICATION, by Peter R. Winters. Appendix B to ONR Research memo. no. 48 on Planning and Control of Industrial Operations, Contract Nonr-760(01). Aug 57, 5p.
Order from LC mi$1.80, ph$1.80 PB 137 045

Carnegie Inst. of Tech. Graduate School of Industrial Administration, Pittsburgh, Pa.
INVENTORY CONTROL IN A MULTIPLE WAREHOUSE SYSTEM, by Peter R. Winters. ONR Research memo. no. 57 on Planning and Control of Industrial Operations, Contract Nonr-760(01). 15 Nov 57, 30p. 7 refs.
Order from LC mi$2.70, ph$4.80 PB 139 489

This paper considers solutions to these problems: first, a way to make item inventory decisions consitent with aggregate production and inventory decisions, and second, the problem of how to make item inventory decisions in a multiple warehouse system. Alternative types of item rules are possible: the review period system, where the inventory level of an item is reviewed at discrete time intervals, but not between, and at the review time a decision is made as to how much to order and when again to review the inventory of that item; or the trigger system, where the item is reordered when the inventory level reaches a certain amount, called the trigger level; at this time a decision is made as to how much to order and what the next trigger level will be. The second, or trigger system is the one used in this paper. It is a more expensive system to operate because it requires continuous information about the level of inventories, but its use should lead to lower buffer stocks, and less run-out, hence lower expected inventory costs.

Hycon Eastern, Inc., Cambridge, Mass.
FUNDAMENTAL MODE FILTER CRYSTALS, by F. Earle Clark. Quarterly progress rept. no. 4, 21 Feb-21 May 58, on Development of Design Data for Fundamental Thickness Shear Filter Crystals, Contract DA 36-039-sc-73234. 17 Sep 58, 18p.
Order from LC mi$2.40, ph$3.30 PB 140 800

Final developments of a spurious mode identification and mapping device is described. Data on both circular and triangular AT plates gathered with the mode mapping device as well as with conventional techniques is presented. Physically identical crystals show individual characteristics to an unexpected degree. Conclusions based on the data are presented including some ideas on the behavior of triangular crystals. Triangular crystals have more freedom from spurious modes than equivalent circular crystals. Reduction of electrode size on both circular and triangular crystals removes some of the drive from spurious modes. (See also PB 140 600)

Hycon Eastern, Inc., Cambridge, Mass.
FUNDAMENTAL MODE FILTER CRYSTALS, by F. Earle Clark. Final rept. for 21 May-30 Sep 58 on Development of Design Data for Fundamental

Thickness Shear Filter Crystals, Contract DA 36-039-sc-73234. 3 Oct 58, 22p. 1 ref.
Order from LC mi$2.40, ph$3.30 PB 140 801

Effects of contour finish, electrodes, mounting, and crystal geometry on the inharmonic modes of fundamental thickness shear crystals. Specifications, for typical filter crystals at 10 Mc, 20 Mc, and 30 Mc, are included. (See also PB 140 800)

Lockheed Aircraft Corp., Burbank, Calif.
HIGH ENERGY RATE METAL FORMING, by Glen N. Rardin, A. F. Watts, and G. L. Tingley. Interim engineering rept. no. 4, 1 Jan-31 Mar 59, on Contract AF 33(600)35543. [1959] 70p. LR-13627.
Order from OTS $1.75 PB 151 849

An evaluation of several methods for application of explosive energy to the forming of sheet metal is presented, as well as metallurgical data on the effect of direct application of explosives to the metal. An analysis of elongation and thinning characteristics of typical formed parts is included.

Material Lab., New York Naval Shipyard, Brooklyn.
SPARKING CHARACTERISTICS OF METALS. Final research and development rept. on Lab. proj. 5407-8. 1 Aug 58 [18]p.
Order from OTS $0.50 PB 151 650

Sparking tests were conducted on various metals in explosive mixtures of gasoline and oxygen-enriched air, and ethyl ether and oxygen-enriched air, for the purpose of developing a procedure for evaluating the sparking characteristics of metals, as a basis for establishing sparking test requirements for nonsparking tools.

Metcut Research Associates, Inc., Cincinnati, Ohio.
MACHINING CHARACTERISTICS OF HIGH STRENGTH THERMAL RESISTANT MATERIALS, PHASE II, by Leonard J. Nowikowski. Interim engineering rept. no. 1, 22 Dec 57-1 Mar 58, on Subcontract to Contract AF 33(600)35967. 25 Mar 58, 12p. Wright Aeronautical serial rept. no. MP.00-162.
Order from LC mi$2.40, ph$3.30 PB 140 795

An outline of the work completed in Phase I is presented in this report.

Metcut Research Associates, Inc., Cincinnati, Ohio.
MACHINING CHARACTERISTICS OF HIGH STRENGTH THERMAL RESISTANT MATERIALS, PHASE II, by Leonard J. Nowikowski. Interim engineering rept. no. 2, 1 Apr-1 July 58, on Subcontract to Contract Af 33(600)35967. 23 July 58, 54p. Wright Aeronautical serial rept. no. MP. 00-169.
Order from LC mi$3.60, ph$9.30 PB 140 796

The machining characteristics in turning, milling, and drilling have been partially evaluated for AISI 4340, AISI 4130, 17-22 AS, Vasco Jet 1000, Unimach 2, Super Tricent, Peerless 56, Halcomb 218, UHS 260, 302 Stainless, 410 Stainless, 422 Stainless, 19-9 DL, 17-7 PH, A-286 and AM-350. The machining data obtained to date in turning, milling and drilling is presented in graphical form to show the relationship between tool life and cutting speed. (See also PB 140 795)

Metcut Research Associates, Inc., Cincinnati, Ohio.
MACHINING CHARACTERISTICS OF HIGH STRENGTH THERMAL RESISTANT MATERIALS, PHASE II, by Leonard J. Nowikowski. Interim engineering rept. no. 3, 1 July-30 Sep 58, on Subcontract to Contract AF 33(600)35967. 25 Oct 58, 100p. Wright Aeronautical serial rept. no. MP. 00-174.
Order from LC mi$5.40, ph$15.30 PB 140 797

Investigation of the machining characteristics in turning, milling and drilling has been conducted on AISI 4340, 17-22 AS, Chromalloy, Vasco Jet 1000, A-286, N-155, 410 Stainless, 422 Stainless, AM-350, R-235 and HS-25. The machining data is presented in graphical form to show the relationship between tool life, cutting speed, feed, tool geometry, and tool material. (See also PB 140 796)

Metcut Research Associates, Inc., Cincinnati, Ohio.
MACHINING CHARACTERISTICS OF HIGH STRENGTH THERMAL RESISTANT MATERIALS, PHASE II, by Leonard J. Nowikowski. Interim engineering rept. no. 5, 1 Jan-31 Mar 59 on Subcontract to Contract AF 33(600)35967. 25 Apr 59, 157p. Wright Aeronautical serial rept. no. MP. 00-188.
Order from LC mi$7.50, ph$24.30 PB 140 798

A study of the machining characteristics in turning, milling, drilling, tapping and grinding has been conducted on AISI 4340, Chromalloy, Vasco Jet 1000, Super Tricent, AISI 302, 19-9 DL, N-155, A-286, 410 Stainless, 422 Stainless, AM-350, R-235, Inconel 700, Inconel 901, Udimet 500 and HS-25. The data for the various machining tests is presented in graphical form to show the relationships between tool life, cutting speed, feed, tool geometry and tool material. A thorough study of workpiece distortion produced in AISI 4340 steel quenched and tempered to 52R_C, by surface grinding and face milling operations, has also been performed. The data for these studies is presented in graphical form to show workpiece distortion as a function of machine variables. (See also PB 140 083

Naval Ordnance Test Station, China Lake, Calif.
THE EXPLOSIVE PRESS AS A RESEARCH TOOL IN MATERIAL BEHAVIOR AND FORMING, by Edward W. LaRocca and John Pearson. 12 May 58, 17p. 6 refs. NOTS-2019; NAVORD rept. 5880.
Order from OTS $0.50 PB 151 844

Small, explosively activated presses have been used as research tools in the study of the behavior of powdered materials under impulsive loads. The double-action press, which is of sandwich-type construction, uses two explosive charges fired simultaneously to drive two opposed pistons together into a central steel cylinder in which the specimen material has been placed. By modifying the working faces of the pistons, materials can be formed into various shapes by the action of the press.

Naval Postgraduate School, Monterey, Calif.
A RADIOCHEMICAL STUDY OF ELECTROPLATING, by Richard A. Reinhardt and Gilbert F. Kinney. June 58, 25p. 4 refs. Technical rept. no. 17.
Order from LC mi$2.70, ph$4.80 PB 140 784

Electroplating of silver from a radioactive solution to determine the suitability of the radioactive tracer technique for the study of irreversible electrode phenomena. The radioactivity method is satisfactory for estimating the amount of plated material, if a flat surface or if a curved surface which can be flattened reproducibly is used. The statistical fluctuations are too large however to permit satisfactory measurements for precise quantitative studies of polarization phenomena.

Office of Technical Services, Washington, D. C.
CERAMIC, PAPER, RUBBER, TEXTILE, WOOD, AND OTHER PRODUCTS AND PROCESSES: GOVERNMENT-OWNED INVENTIONS AVAILABLE FOR LICENSE ACCUMULATED JULY 1955 THROUGH JUNE 1958. [1959] 13p. Patent Abstract Series, no. 7, suppl. no. 2.
Order from OTS $0.50 PB 151 512

Supplements PB 111 470, Dec 53, and PB 111 854, Jan 54-June 55.

For each invention the title of the invention, the United States Patent number, the name of the inventor, the name of the Government agency administering the patent, and an abstract of the patent on the invention are given. Evaluation of the invention with respect to its industrial application is facilitated by an examination of the technical data contained in the abstract.

Office of Technical Services, Washington, D. C.
INSTRUMENTATION: GOVERNMENT-OWNED INVENTIONS AVAILABLE FOR LICENSE ACCUMULATED JULY 1955 THROUGH JUNE 1958. [1959] 54p. Patent Abstract Series, no. 1, suppl. no. 2.
Order from OTS $1.25 PB 151 506

Supplements PB 111 464, Dec 53, and PB 111 854, Jan 54-June 55.

For each invention the title of the invention, the United States Patent number, the name of the inventor, the name of the Government agency administering the patent, and an abstract of the patent on the invention are given. Evaluation of the invention with respect to its industrial application is facilitated by an examination of the technical data contained in the abstract.

Office of Technical Services, Washington, D. C.
METAL PROCESSES AND APPARATUS, MACHINERY, AND TRANSPORTATION EQUIPMENT: GOVERNMENT-OWNED INVENTIONS AVAILABLE FOR LICENSE ACCUMULATED JULY 1955 THROUGH JUNE 58. [1959] 53p. Patent Abstracts Series, no. 4, suppl. no. 2.
Order from OTS $1.25 PB 151 509

Supplements PB 111 467, Dec 53, and PB 111 854, Jan 54-June 55.

For each invention the title of the invention, the United States Patent number, the name of the inventor, the name of the Government agency administering the patent, and an abstract of the patent on the invention are given. Evaluation of the invention with respect to its industrial application is facilitated by an examination of the technical data contained in the abstract.

Rodman Lab., Watertown Arsenal, Mass.
THE COMPARISON TYPE OF MACHINING TEST, by Roy Mennell. Feb 59, 12p. 6 refs. Rept. no. RPL 23/7.
Order from LC mi$2.40, ph$3.30 PB 139 658

The statistical technique developed in this report is designed to reduce the number of tests to a minimum. A description of how to apply the test and several examples of its use.

Stanford U., Calif.
A SAMPLE SURVEY OF INDUSTRIAL OPERATIONS RESEARCH ACTIVITIES, by Ronald W. Hovey and Harvey M. Wagner. Technical rept. no. 55 on Contract N6onr-25133. 26 May 58, 2 refs.
Order from LC mi$2.40, PB 139 589

In teaching operations research in a university, in advising students as to career opportunities, and in recommending to industrial and commerical firms the consideration of recent management science techniques, one inevitably faces the following questions: Who is adopting operations research methods? What are the areas of current application? Has the approach been successful? What educational training is recommended towards a profession in this area? We have sought partial and tentative answers to these queries by a mail questionnaire sent to 158 companies in the United States and Canada, of which 90 firms replied.

Transport, Traction and Hoist Facilities

Cornell U. Medical Coll., New York.
A STUDY OF AUTOMOBILE DOORS OPENING UNDER CRASH CONDITIONS: THE RELATIONSHIP BETWEEN THE OPENING OF FRONT DOORS AND THE AREA OF THE PASSENGER AUTOMOBILE SUSTAINING THE PRINCIPAL IMPACT, by John O. Moore and Boris Tourin. Technical rept. no. 2 on Automative Crash Injury Research, DA 49-007-md-483. 1 Aug 54, 42p.
Order from LC mi$3.30, ph$7.80 PB 137 293

Two samples of accident data, a "fatal" sample and a sample of the full-range of force patterns associated with both injuries and fatalities in automobile accidents, are studied. The relationship between area impacts (corner, side, front, rollover) and the occurrence of front doors opening is examined. The frequency of front doors opening and of occupant ejection through these opened doors, as well as the effect of ejection on the risk of injury, are studied. It is found that: (1) the opening of front doors in accidents is a common occurrence, (2) each of the four types of impacts has its own positive or negative relationship to front doors opening, and (3) ejection significantly increases the risk of moderate through

fatal injuries, and is demonstrated as a serious safety problem.

Northern Research and Engineering Corp., Cambridge, Mass.
ENGINEERING STUDY OF MOBILE FUEL DISPENSING SYSTEMS. Rept. on Contract DA 19-129-qm-1153. Sep 58, 199p.
Order from LC mi$8.70, ph$30.30 PB 137 186

This report summarizes the results of a five-month engineering design program directed toward optimum design arrangements and modes of installation of mobile fuel dispensing systems for use on the M-54, five-ton, military cargo vehicle. However, the results of this investigation have broad applications to the mobile fuel dispensing problem in general and are not necessarily restricted to any particular vehicle. A component survey of possible drives (internal combustion engines, electric motors, hydraulic motors, and mechanical drives), pumps, filters, water separators, valves, hose equipment, and gauges and meters has been made in order to determine the optimum standard commercial and military equipment that might have application to such a dispensing system. The results of this survey are discussed in the text.

MATERIALS

Army Chemical Warfare Labs., Army Chemical Center, Md.
MATERIALS REVIEW [NO. 4] by Arthur Lyem. Rept. for 6 Jan-15 July 58. Nov 58, 58p. 185 refs. CWL Special Pub. 4-7.
Order from LC mi$3.60, ph$9.30 PB 139 535

The purpose of this periodic review is to present information on important technical and scientific high lights regarding materials research here and abroad, principally in the polymer and plastics field.

George Washington U., Washington, D. C.
TOWARD THE FORMULATION AND SOLUTION OF THE ALLOWANCE LIST PROBLEM, by Marvin Debicoff and Henry Solomon. Rept. on Logistics Research Project, Contract Nonr-761(05). 21 May 58, 47p. Serial T-84/58.
Order from LC mi$3.30, ph$7.80 PB 139 644

This study describes a newly designed technique for constructing allowance lists for Navy ships. The allowance list methodology described herein includes a consideration of the following factors: endurance loading, resupply policies, the period of support, criteria for selecting the range and depth of insurance items, and the storage limitations of ships. Also considered are such item characteristics as usage rates, fluctuations in usage rates, population, unit cube, and military worth.

Virginia Agricultural Experiment Station, Blacksburg.
RANKING IN TRIPLE COMPARISONS, by R. N. Pendergrass and R. A. Bradley. Technical rept. no. 1 on Development of Statistical Methods for Experimental Designs in Quality Control and Surveillance Testing, Contract Nonr-2352(01). Nov 57, 131p. 36 refs.
Order from LC mi$6.90, ph$21.30 PB 137 061

The developments in this report are largely mathematical. The Introduction reviews the current status of ranking techniques and their development and posed the problems to be considered. Possible models for triple comparisons are given in the second chapter on Mathematical Models. Illustrations of the use of the method derived are given in the seventh chapter on Numerical Examples. The reader that wishes may by-pass the intervening mathematical discussions and consider these three chapters with a view to seeing the methods required and applied.

Adhesives and Sealants

Bureau of Ships, Washington, D. C.
STATISTICAL PLAN FOR ADHESIVE STANDARDIZATION PROGRAM, by A. Lieberman and B. Orleans 24 June 57, 3p. Rept. no. 373-11(74).
Order from LC mi$1.80, ph$1.80 PB 139 509

The object was to determine the effect on block shear, percent wood failure and percent delamination of different adhesives and curing periods (combination of a curing time and an assembly period).

Picatinny Arsenal [Dover, N. J.]
ADHESIVES FOR ATTACHING ELECTRIC STRAIN GAGES TO PLASTICS, by H. Sigler and S. Stivala. Unrestricted abstract, Oct 58, 5p. 1 ref. Technical note 21.
Order from OTS $0.50 PB 151 845

A series of adhesives were used to adhere the SR-4 type strain gages to thermoplastic specimens. Test data were unsatisfactory, no matter what combination of adhesive and specimen was tried. All tests are discussed and tabulated.

Ceramics and Refractories

Armour Research Foundation, Chicago, Ill.
MECHANICAL PROTECTION OF THE W/Ir THERMOCOUPLE, by Gary Steven and Walter C. Troy. Rept. no. 23, 8 Oct-8 Nov 49, on Project 90-565 B. 14 Nov 49, 8p. NEPA 1214-ARM-24; ATI-186 924.
Order from LC mi$1.80, ph$1.80 PB 137 033

Preliminary tests were conducted with recrystallized alumina protection tubes. In an alumina tube continuously flushed with argon. a W/Ir thermocouple

operated satisfactorily nine hours at 1900°C. An assembly pressurized with argon failed mechanically after three hours due to accidental breakage of the protection tube. Tests were conducted on the thermal shock resistance and gas tightness of thin wall alumina tubes. An evaluation was made of (1) the effect of the flow rate of neutral atmosphere on the accuracy of temperature measurement, and (2) the response of the enclosed thermocouple to temperature fluctuations about 1900°C.

Armour Research Foundation, Chicago, Ill.
MECHANICAL PROTECTION OF THE A/Ir THERMOCOUPLE, by Gary Steven and Walter C. Troy. Rept. no. 26 on Project 90-565 B. 16 Feb 50, 4p. NEPA 1303-ARM-28; ATI-186 925.
Order from LC mi$1.80, ph$1.80 PB 137 034

See PB 137 033

Armour Research Foundation, Chicago, Ill.
MECHANICAL PROTECTION OF THE W/Ir THERMOCOUPLE, by Gary Steven and Walter C. Troy. Rept. no. 27, 17 Feb-10 Mar 50, on Project 90-565 B. 15 Mar 50, 8p. NEPA 1347-ARM-31; ATI-184 719.
Order from LC mi$1.80, ph$1.80 PB 137 035

A method was developed for embedding the W/Ir thermocouple in a die pressed alumina compact and firing this composite body to about 1900°C. Although crack free alumina protected thermocouples have thus been produced, the high temperature tests of the thermocouples in the gas fired furnace have not as yet been successful. The Ir/60% Ir, 40% Rh thermocouple was tested at a temperature between 1950°C and 2000°C in an atmosphere containing about 20% oxygen. Failure of the thermocouple at the hot junction occurred after 12 hours of high temperature operation. The two-hole thermocouple insulator with one recessed end was used to completely enclose the W/Ir thermocouple by fusing the alumina around the hot junction bead of the thermocouple. Preliminary tests showed promise for this method of protection. Rubber mold pressing of alumina has been discontinued because of unsatisfactory green strength of the compact. (See also PB 137 034)

Armour Research Foundation, Chicago, Ill.
MECHANICAL PROTECTION OF THE W/Ir THERMOCOUPLE, by Gary Steven and Walter C. Troy. Rept. no. 28, 11 Mar-12 Apr 50, on Project 90-565 B. 14 Apr 50, 9p. NEPA 1390-ARM-32; ATI-184 720.
Order from LC mi$1.80, ph$1.80 PB 137 038

W/Ir thermocouples were operated in an oxidizing environment in alumina tubes to study variables contributing to early failure. Whenever possible, corrective measures were taken. It was thus possible to increase the life of the protection tube to a total of 44 hours, 26 hours of which consisted of operation at a temperature of 1700°C and the remaining 18 hours at 1900°C. (See also PB 137 035)

Armour Research Foundation, Chicago, Ill.
MECHANICAL PROTECTION OF THE W/Ir THERMOCOUPLE: SAPHIRE TUBE PROTECTION, by Gary Steven and Walter C. Troy. Rept. no. 29, 12 Apr-10 May 50, on Project 90-565 B. 15 May 50, 8p. NEPA 1414-ARM-34; ATI-184 721.
Order from LC mi$1.80, ph$1.80 PB 137 039

Most of the period was devoted to the testing of sapphire tubes in the protection of the W/Ir thermocouple from oxidizing atmospheres. A continuous 75-hour run at 1900°C, in an atmosphere containing about 1.5% free oxygen, resulted in a partial oxidation of the thermocouple. A progressive loss of thermal emf was observed after 50 hours of operation. A second run in an atmosphere enriched to a content of 10-20% oxygen ended with a sapphire tube failure after 10 hours of operation. (See also PB 137 038)

Armour Research Foundation, Chicago, Ill.
MECHANICAL PROTECTION OF THE W/Ir THERMOCOUPLE, by Gary Steven and W. C. Troy. Rept. no. 31, 13 June-13 July 50, on Project 90-565B. 15 July 50, 2p. NEPA 1497; ATI-184 723.
Order from LC mi$1.80, ph$1.80 PB 137 036

At the beginning of the period work on the present contract was terminated. A thermocouple assembly complete with auxillary fittings and spare alumina tubes (including a drilled sapphire tube) was fitted into a wooden carrying box. (See also PB 137 039)

Illinois U., Urbana.
THICK INSULATION CERAMIC COATINGS FOR METAL, by W. F. Zimmerman, W. J. Plankenhorn and D. G. Bennett. Rept. no. 58 on Contract W33-038-ac-14520. Nov 51, 39p. 13 refs. WADC Technical rept. 52-28; ATI-143 774.
Order from LC mi$3.00, ph$6.30 PB 140 860

Conventional enamel-type coatings were formulated in which each successive coating layer possessed a slightly different coefficient of thermal expansion and refractory composition. Thick coatings were also formed from compositions which were cast or rammed in place and which were bonded by glass or organic materials. It was concluded that the application of light weight insulating bodies to metal offers the most promise in the further development of thick insulating coatings.

National Bureau of Standards, Washington, D. C.
PHYSICAL PROPERTIES OF HIGH TEMPERATURE MATERIALS. PART IV. THERMAL DIFFUSIVITY APPARATUS FOR 100° TO 1,500° C, by Howard W. Flieger, Jr. and Defoe C. Ginnings. Rept. for 1 Apr 56-31 Aug 57 on Material Analysis and Evaluation Techniques, Contract AF 33(616)56-21. Oct 57, 14p. WADC Technical rept. 57-374, Pt. 4.
Order from LC mi$2.40, ph$3.30 PB 140 817

An apparatus has been designed and constructed for measuring diffusivities up to about 1500°C. Values of thermal conductivity may be derived. The apparatus was designed for measurements on materials having thermal diffusivity values less than 0.1 $cm^2/sec.$, such as most refractory oxides at moderate to high temperatures.

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
REPORT ON THORIUM SULFIDES, by M. A. Schwartz. Dec 48, 21p. 12 refs. NEPA-873-EMR-41; supersedes section on thorium sulfides in NEPA-309-IHR-E4.
Order from LC mi$2.70, ph$4.80 PB 140 789

New Jersey Ceramic Research Station, Rutgers U., New Brunswick.
TECHNICAL REPORT NO. 13, by Wing C. Lo and Harold T. Smyth. Rept. on Contract N7onr-345(03). Nov 57, 16p. 3 refs.
Order from LC mi$2.40, ph$3.30 PB 137 246

Debye type formulas relating K, the dielectric constant and tan δ, the dissipation factor, with frequency and temperature have been worked out for glass.

New Jersey Ceramic Research Station, Rutgers U., New Brunswick.
ELASTIC PROPERTIES OF GLASSES, by Harold T. Smyth and Wing C. Lo. Technical rept. no. 12 on Contract N7onr-345(03). 1 Nov 57, 15p. 6 refs.
Order from LC mi$2.40, ph$3.30 PB 137 245

Most glasses have values of Poisson's ratio in the neighborhood of .25 because most of the work done in deforming the glass is expended in stretching or compressing the Si-O-Si units. Most glasses have values somewhat lower than .25 because some work must also be expended in deforming the silica oxygen tetrahedra. A few glasses have values higher than .25 because in these work must also be done in deforming those large ions which fill the interstices in which they are located.

New York State Coll. of Ceramics, Alfred U.
REINFORCEMENT AND CLADDING OF CERMETS, by Ronald Francis, A. David Joseph and others. Rept. for Jan-Dec 55 on Gas Turbine Technology, Contract AF 33(616)2414. Dec 55, 39p. 2 refs. WADC Technical rept. 55-489; AD-108 381.
Order from LC mi$3.00, ph$6.30 PB 140 861

A technique is described whereby some nickel base cermets can be clad with a metal coating which gives considerable increase in impact strength but has no deleterious effect on cross bending strength. A technique for the placement of cermet and ceramic rods in super-alloys is described and some preliminary evaluation data included.

Smith, A. O., Corp., Milwaukee, Wisc.
REPORT ON NEPA PROJECT AT A. O. SMITH FOR MONTH ENDING JULY 20, 1949, by M. K. Blanchard and C. A. Marcowka. 20 July 49, 22p. Rept. no. CRL-HTC-18; NEPA 1090-AOS-18; ATI-200 923.
Order from LC mi$2.70, ph$4.80 PB 137 040

Contents:
Study of new coating compositions
Investigation of refractory overcoating compositions
Oxidation testing of coatings
Sticking tests of overcoatings
Oxidation test of overcoating

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
RADIATION EFFECTS ON THE THERMODYNAMIC AND PHYSICAL PROPERTIES OF SELECTED POLYPHENYL ETHERS, by William B. Cheney. Master's thesis. Mar 59, 61p. 16 refs. GNE-59-4.
Order from LC mi$3.90, ph$10.80 PB 140 931

Diphenyl ether, 1,4 diphenoxybenzene, and bis(p-phenoxyphenyl) ether were irradiated by electrons) from a 3 Mev Van der Graaf generator to an absorbed dosage of 10^{11} erg/gm C. The physical and thermodynamic properties of these ethers, both irradiated and unirradiated, were determined. From the data obtained the heat transfer coefficients were calculated. It was determined that electron irradiation will not seriously affect the use of these compounds as fluids and lubricants in a high performance nuclear system.

Battelle Memorial Inst., Columbus, Ohio.
DEVELOPMENT OF DIE LUBRICANTS FOR FORGING AND EXTRUDING FERROUS AND NONFERROUS MATERIALS, by H. L. Shaw, F. W. Boulger, and C. H. Lorig. Summary rept. on Contract AF 33(600)26272. 31 Oct 55, 246p. 43 refs. AD-94 742.
Order from LC mi$11.10, ph$39.30 PB 140 915

Esso Research and Engineering Co., Linden, N. J.
ATOMIZATION IN HIGH VELOCITY AIR STREAMS, by Malcolm A. Weiss and Charles H. Worsham. Rept. on Contract NOrd-16706. May 58, 355p. 163 refs. Bumblebee Series rept. no. 277; AD-201 456.
Order from LC mi$11.10, ph$54.60 PB 140 780

An experimental study was made of the drop size distributions resulting from spraying liquids into large air streams of sustained high velocity. The intent was to simulate fuel injection in turbojet afterburners and in ramjets; a knowledge of the drop sizes obtained would help in the design of jet engines and their fuel systems.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
PILOT-PLANT EVALUATION OF SULFATE WOOD PULP NITROCELLULOSE FOR USE IN SELECTED AND CAST DOUBLE-BASE ROCKET PROPELLANTS, by Russell L. Trask. Apr 59, 35p. 17 refs. Technical rept. 2578; AD-207 777.
Order from LC mi$3.00, ph$6.30 PB 140 754

Nitrocelluloses prepared by a commercial nitrating plant were evaluated in the manufacture of IMR, M1, and M2 artillery and OGK rocket propellants. It was found that sulfate wood pulps can be used to satisfy over 70% of Ordnance nitrocellulose requirements for propellant manufacture. Further IMR propellant processing studies and ballistic evaluation of the resulting propellants, however, will have to be completed to determine whether sulfate wood pulp nitrocellulose can be used in small arms propellants. On the basis of these studies, Purchase Description PA-PD-212 was issued

presenting the requirements necessary for sulfate wood pulps to be suitable for military use on a plant scale.

Ordnance Fuels and Lubricants Research Lab., Southwest Research Inst., San Antonio, Tex.
STABILITY OF MIL-C-3056 TYPE GASOLINE, by John N. Bowden. Rept. on Contract DA 23-072-ORD-1144. Nov 58, 55p. 6 refs.
Order from LC mi$3.60, ph$9.30 PB 139 526

Techniques designed to indicate induction system deposit tendencies of gasolines have been investigated. The investigation included study of the Shell Glass Manifold Test, Union Induction System Deposit Test, a chromatogum technique, and a modification of the Shell Manifold Test.

Ordnance Fuels and Lubricants Research Lab., Southwest Research Inst., San Antonio, Tex.
STUDY OF THE PERFORMANCE OF A JP-4 TYPE FUEL IN COMMERCIAL COMPRESSION IGNITION ENGINES AND ACCESSORIES, by Joseph J. Brett. Rept. on Contract DA 23-072-ORD-1144. Jan 59, 104p.
Order from LC mi$5.70, ph$16.80 PB 140 746

The technical approach was divided into four phases, which were the acquisition and installation of a suitable fuel injection bench test apparatus to study the effects of a JP-4 fuel in fuel injection systems; performance of bench tests using an American Bosch APE-6B and a Roosa Master Model D fuel injection pump; extended engine operations with a JP-4 fuel; and a comparison of deposit-forming tendencies of the JP-4 and diesel fuels using a CFR coker.

Propulsion Research Lab., Polytechnic Inst. of Brooklyn, N. Y
AEROTHERMOCHEMISTRY OF JET PROPULSION LIQUID PROPELLANT ROCKET MOTORS, by T. Paul Torda. Rept. on Contract AF 49(638)165. Jan 59, 36p. 21 refs. PRL TN-59-3; AFOSR TN-59-80; AD-210 140.
Order from LC mi$3.00, ph$6.30 PB 139 556

This paper deals with phenomena in compressible flows in which chemical and phase changes take place. A particular problem was chosen so that a specific application of aerothermochemistry may be illustrated. The problem chosen is combustion in liquid propellant rocket motors. One of the least understood phases of aerothermochemistry is the combustion of liquid sprays. The state of the art is reviewed in detail.

Propulsion Research Lab., Polytechnic Inst. of Brooklyn, N. Y.
NON-LINEAR THEORY OF COMBUSTION INSTABILITY: LIQUID PROPELLANT ROCKET MOTORS, by T. Paul Torda and Samuel Z. Burstein. Rept. on Contract AF 49(638)165. 1 Dec 58, 113p. 27 refs. Technical note PRL-TN-58-1; AFOSR TN-59-60; AD-209 491.
Order from LC mi$6.00, ph$18.30 PB 139 653

The state of the art is discussed of combustion instability and sealing of liquid propellant rocket motors. A new non-linear theory is developed applicable to non-steady, one-dimensional flows with mass and energy addition. The resulting differential equations are solved by the method of characteristics.

Leather and Textiles

Bjorksten Research Labs., Inc., Madison, Wis.
QUARTZ FIBERS IN HIGH TEMPERATURE RESISTANT MATERIALS, by William S. Fiedler, Burns A. Cash and others. Rept. for 1 May 56-31 May 58 on Contract AF 18(603)42. May 58, 105p. 89 refs. AFOSR TR-58-91; AD-162 132.
Order from LC mi$5.70, ph$16.80 PB 139 575

Continuous production of vitreous silica fiber by cane drawing and drawing from a bushing, were studied down to a fineness of eight microns. These fibers were coated with metallic aluminum and silver; and hot-pressed laminates were made from the aluminum-coated samples. The tensile strengths of the fibers produced were in the range of 75,000 to 400,000 lb./in.^{2} with a portion breaking in the 600,000 lb./in.^{2} range.

Navy Clothing and Textile Office, Brooklyn, N. Y.
AN INTRODUCTORY PSYCHOPHYSICAL STUDY OF BREAK IN LEATHER. PHASE I, DEVELOPMENT AND EVALUATION OF THE LEATHER GRAINOMETER, by Milton Bailey. Rept. on Service Footwear. Apr 58, 24p. 21 refs. Research and Development rept. no. 24.
Order from OTS $0.75 PB 151 688

An investigation of the break characteristic was undertaken. This work resulted in the development of an instrument called a Leather Grainometer. The instrument helped to define break objectively. Utilizing the Leather Grainometer, inexperienced personnel appear able to grade breaks more accurately and consistently than experienced commercial and technical personnel using the subjective, visual approach.

Owens-Corning Fiberglas Corp., Newark, Ohio
PROPERTIES OF FIBERGLAS AT ELEVATED TEMPERATURES, by W. H. Otto. Quarterly rept. no. 1, 15 June-15 Sep 58, on Contract NOas-58-841-c. 22 Sep 58, 35p. 2 refs.
Order from LC mi$3.00, ph$6.30 PB 139 582

Mechanical properties of a lime-alumina-borosilicate glass (E-glass) have been measured at elevated temperatures. Tensile strength and inelastic yield have been measured at temperatures up to 1200°F. The effect of high temperatures on modulus of elasticity have been studied. Stress-rupture curves have been established at temperatures up to 1100°F for load durations up to twenty hours.

Plastics Lab., Princeton U., N. J.
REACTION SPINNING OF FIBERS, by Herbert A. Pohl. Rept. no. 9a on Contract DA 36-039-sc-70154.

1 Dec 57, 13p. 7 refs. Technical rept. no. 48A.
Order from LC mi$2.40, ph$3.30 PB 137 296

A method of forming fibers which is relatively new, yet of potentially wide application is described. The process may be termed "reaction-spinning". In reaction-spinning, the usual viscosity increase required between spinneret and windup is accomplished by chemical reaction. Incompletely polymerized or incompletely solubilized polymer is forced through an extrusion die or spinneret under such conditions of rate, temperature, concentration, and activation, that the polymerization proceeds rapidly within the fiber after it leaves the spinneret. This causes the soft extruded fiber to set to a solid or suitably semi-solid state in fiber form on the windup package where further reaction will complete the transformation to the desired fiber properties. Principles and experimental examples of the process are described.

Quartermaster Research and Engineering Center, Natick, Mass.
SUMMARY OF SPECIFICATION REQUIREMENTS FOR MILITARY LEATHER, by Edward T. Steiner. Sep 58, 84p. Footwear and Leather Series rept. no. 12.
Order from OTS $2.00 PB 151 580

This report, "Summary of Specification Requirements for Military Leather," provides in summary form a statement of the specification requirements for leather used by all military services. The report, the first of its kind on leather, is a general compilation of all requirements in one publication, describing the essential characteristics of basic leathers and leather-containing end items destined for military usage. Every effort has been made to make the report as complete as possible through coordinative review by all military services, Federal custodians of leather specifications, and the counseling body of the American leather industry. The information provided in the report should enable industry to more readily interpret military requirements for leather and should facilitate industrial production for military needs.

Paints and Finishes

American Chemical Paint Co. [Ambler, Pa.]
[LIQUID CONTAINER LINERS] by H. L. Faigen, W. D. Boyer and others. Final rept. on Contract DA 44-109-qm-645. 18 Dec 52, declassified 15 Oct 57, 161p.
Order from LC mi$7.80, ph$25.80 PB 139 498

A detailed survey was planned to determine the effect of various pre-paint treatments on the performance of certain linings developed for use on the interiors of gas cans and drums by prior OQMG sponsored research.

Army Engineer Research and Development Labs., Fort Belvoir, Va.
CAMOUFLAGE OF ARMY AIRCRAFT, by Joseph F. Hannigan. Final rept. 10 Dec 58, 92p. 18 refs. Technical rept. no. 1559-TR.
Order from LC mi$5.40, ph$15.30 PB 139 541

Report covers Army aircraft camouflage measures which are appropriate for and compatible with concepts of future warfare in any geographical area. Appropriate camouflage paint schemes with the minimum logistical burden are prescribed herein for temperate, arctic, desert, and tropical terrain.

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
ANALYSIS OF WATER EMULSION PAINTS, by M. H. Swann. 19 Feb 59, 7p. 1 ref. Rept. no. CCL #73.
Order from OTS $0.50 PB 151 687

Most of the conventional methods of analysis for various coatings are not useful in the analysis of the emulsion paints. Responsibility for this lies in their radical departure from conventional systems consisting of pigments dispersed in solutions of resins dissolved in organic solvents. In the emulsion coatings, both pigments and resins are dispersed in water and contain, in addition, emulsifying agents, stabilizers, and buffers for pH control. The main obstacle to successful analysis of these coatings has been the lack of a satisfactory method for separating the pigments from the polymer portion. A solution to this problem has been found and is reported herein, supplying a basis for the complete analysis of this type of coating material.

Fansteel Metallurgical Corp., North Chicago, Ill.
INFORMAL MONTHLY PROGRESS REPORT, JUNE 21, 1949 TO JULY 20, 1949, by Ralph Wehrmann. [1949] 6p. 1 ref. NEPA 1094-FAN-27; ATI-200 954.
Order from LC mi$1.80, ph$1.80 PB 137 032

The study of the preparation and properties of silicon coatings on graphite was continued. An electrolytic method of determining coating porosity shows some promise.

Plastics

Burgess Battery Co., Freeport, Ill.
PLASTIC SEALS, by C. J. Broughton. Quarterly progress rept. no. 3, 1 Dec 57-28 Feb 58, on Contract DA 36-039-sc-10527. 1 Mar 58, 11p.
Order from LC mi$2.40, ph$3.30 PB 137 167

Investigation of various thermosetting materials and thermoplastic materials suitable for seals for dry cells has been carried forth. During this quarter the work on the project was devoted to the investigation of the materials previously suggested by plastic companies and investigation of new materials.

Burgess Battery Co., Freeport, Ill.
PLASTIC SEALS, by C. J. Broughton. Quarterly progress rept. no. 4, 1 Mar-31 May 58, on Contract DA 36-039-sc-10527. 18 June 58, 13p.
Order from LC mi$2.40, ph$3.30 PB 137 166

Investigation of the thermosetting material "gunk" has been carried forth. A mold was made for 'N' size seals and seals were molded using the polyester "gunk". 'N' size cells were then fabricated, using these seals. The majority of the seals failed, due to cracks which developed in the molded "gunk" material after aging for a few days. Good cells were selected and stored at 130°F. The spinning tools were used in making the 'N' cells and proved very effective with no difficulty encountered. (See also PB 137 167)

[Feltman Research and Engineering] Labs., Picatinny Arsenal, Dover, N. J.
LITERATURE SURVEY ON THE SYNTHESIS OF EPOXY RESINS FROM BIS-PHENOLS, by Walter Erich. Mar 58, 37p. 53 refs. Technical notes no. 12; AD-158 199.
Order from OTS $1.00 PB 151 730

This report includes a literature survey on the synthesis of epoxy resins from bis-phenols and a plan of research for the preparation of epoxy adhesives. Disadvantages of current adhesives are discussed and methods for overcoming these faults are proposed. Details are given on the manufacture of epoxy resins of varying molecular weights as well as on the preparation of bis-phenols used in epoxy synthesis. Finally, a complete bibliography is included on every 4, 4-dihydroxydiphenylalkane that has been synthesized up to June 1957.

Industrial Test Lab., Philadelphia Naval Shipyard, Pa.
REPAIR KIT FOR GLASS REINFORCED PLASTIC LAMINATE: DEVELOPMENT OF TOXICITY REQUIREMENTS, by M. S. Gabis and M. Anmuth. Apr 58, 14p. 3 refs. Development rept. no. 2988.
Order from LC mi$2.40, ph$3.30 PB 140 888

The toxic hazards involved in the use of epoxy resins and catalysts have been evaluated for the purpose of developing toxicity requirements and test methods for inclusion in a specification for repair kits for glass reinforced plastic laminates. Tests with laboratory animals showed all of the catalysts under test to be primary cutaneous irritants. Other animal tests showed that exposure to the vapors emitted from each resin-catalyst system caused irritation to the mucous membranes. Since no suitable, less toxic materials are available, specific toxicity requirements cannot be developed at this time. However the test data obtained will serve as an estimate of the hazards which may be expected from the use of such materials. The precautionary measures prescribed in the specification draft, together with the recommendations made in this report, should be suitable for safeguarding personnel in the use of the described materials.

Material Lab., New York Naval Shipyard, Brooklyn.
EVALUATION OF DEFLECTION UNDER LOAD OF RIGID UNPLASTICIZED HIGH IMPACT POLYVINYLCHLORIDE PIPE. Final rept. 17 Sep 58, 17p. 1 ref. Lab. project 5712-29.
Order from LC mi$2.40, ph$3.30 PB 139 522

This investigation was conducted to determine optimum hanger spacing for PVC pipe.

Material Lab., New York Naval Shipyard, Brooklyn.
4" RIGID UNPLASTICIZED HIGH IMPACT POLYVINYLCHLORIDE PIPE (SCHEDULES 80 AND 120). Specification development rept. (Final). 22 Aug 58, 35p. 4 refs. Lab. project 5712-26.
Order from LC mi$3.00, ph$6.30 PB 139 521

Material Lab., New York Naval Shipyard, Brooklyn.
INVESTIGATION OF THE PHYSICAL PROPERTIES OF RESILIENT POLYURETHANE FOAM MATERIALS, by S. A. Eller. Final rept. 26 Jan 59, 80p. 7 refs. Lab. project 4981-23.
Order from LC mi$4.50, ph$12.30 PB 140 743

The physical properties of 19 different samples of both the polyester and polyether types of resilient polyurethane foam material submitted by 12 manufacturers were investigated. The compression resistance of the samples, based on load-compression data, was determined in the initial "as received" condition, and after different combustions of oven aging and relative humidities various flexure and compression tests were also run. The hysteresis, Pandux hardness, Bashore resilience, fire retardance, density, volume swell and static fatigue properties of the samples were also determined.

Midwest Research Inst., Kansas City, Mo.
FABRICATION AND DEVELOPMENT OF COMPOSITE PLASTIC PLATES, by Howard W. Christie and Martin N. Schuler. Quarterly progress rept. no. 1, Phase 2, 16 July-15 Oct 58, on Contract NOas-58-563-c. 23 Jan 59, 23p. 8 refs.
Order from LC mi$2.70, ph$4.80 PB 139 583

The production of composite plastic plates consisting of diethylene glycol bis(allyl carbonate) cast onto acrylic sheet has been accomplished. These composites were optically satisfactory, but adhesion between the two layers of the composite was very low. This report discusses work toward the improvement of this adhesion. Both mechanical and chemical approaches were involved.

Midwest Research Inst., Kansas City, Mo.
FABRICATION AND DEVELOPMENT OF COMPOSITE PLASTIC PLATES, by Howard W. Christie and Martin N. Schuler. Quarterly progress rept. no. 2, phase 2, 16 Oct 58-15 Jan 59, on Contract NOas-58-563-c. 13 Feb 59, 31p. 11 refs.
Order from LC mi$3.00, ph$6.30 PB 139 584

Several curved composite laminates have been fabricated. These composites consisted of diethylene glycol bis(allyl carbonate) cast onto curved acrylic sheet, 9.5 in. in diameter. Work has been centered on two problem areas, development of fabrication techniques for producing curved composite laminates and reduction of the time required to polymerize the allyl resins. (See also PB 139 583)

North Carolina State Coll., Raleigh.
IMPACT AND SHOCK RESISTANCE OF PLASTICS, by P. H. McDonald and J. A. Edwards. Final rept. for 1 Nov 55-31 July 57 on Contract NObs-72035. Dec 57, 49p. AD-154 878.
Order from OTS $1.25 PB 151 729

Considerable interest has been shown recently in investigating the impact strength of materials as a function of the rate of loading. It appears that for dynamic loads the resistance will vary with the rate of loading. The apparatus described in this writing was designed and built in an effort to obtain a more suitable method of measuring impact resistance of plastics, and to investigate experimentally any existing relationships between impact resistance and the rate of loading.

Redstone Arsenal, Huntsville, Ala.
TENSILE PROPERTIES FOR THREE THERMOPLASTICS OVER SIX DECADES OF RATE, by R. E. Ely. 31 Oct 57 [74]p. 10 refs. Rept. no. 2R25F; AD-154 401.
Order from OTS $2.00 PB 151 573

The tensile properties of polymethyl methacrylate and ethyl cellulose are reported for testing machine crosshead velocities of 0.02 to over 5000 in/min; polyethylene data are reported for a slightly smaller range of velocities. Fracture times varied from a few milliseconds to hundreds of minutes. A pneumatically operated, high speed machine and a standard tester were used. The temperature ranged from -76°F to 158°F with a few tests as low as -320°F. The range of tensile strengths in one case was over 1000 per cent. Brittle points are found at high rates and low temperatures. Some data for ultimate strains and elastic moduli are given.

Reinforced Plastics Lab., Owens-Corning Fiberglas Corp., Ashton, R. I.
CONTROL OF VARIABLES IN HEAT RESISTANT GLASS REINFORCED PLASTICS. VOL. I. SUMMARY REPORT, by Ralph H. Sonneborn, Allen B. Isham, and Frank W. Dennen. Final rept. for June 57-Dec 58 on Contract AF 33(600)35031. Jan 59, 62p. AMC Technical rept. 59-7-589, vol. 1; AD-156 069, vol. 2.
Order from OTS $1.75 PB 151 802

The widespread use of reinforced plastics in structural applications has been hampered because of inconsistencies in properties of molded parts. Much of the inconsistency is caused by lack of precise knowledge of the variability associated with the materials and production processes. The effects of these types of variables on laminate properties were determined. Eight resin systems were investigated: a conventional liquid polyester, a conventional polyester prepreg, a heat resistant polyester, a conventional epoxy, a heat resistant epoxy, a low pressure heat resistant phenolic, a high pressure heat resistant phenolic, and a heat resistant silicone. Five types of fibrous glass reinforcement were studied: roving and yarn for unidirectional reinforcement, and the 181, 143, and 120 styles of woven fabric. Three fabric and Yarn size removal systems were investigated, as well as the application techniques for five finishes: Volan A, Garan, 301, 136, and A-1100. Laminates in three thicknesses from 0.050 to 0.400 inches were covered. The conditions for making the highest quality panels for specific properties are stated, together with their statistically reliable values. The causes and extent of variations are given.

Reinforced Plastics Lab., Owens--Corning Fiberglas Corp., Ashton, R. I.
CONTROL OF VARIABLES IN HEAT RESISTANT GLASS REINFORCED PLASTICS. VOL. II. ENGINEERING REPORT, by Ralph H. Sonneborn, Allan B. Isham and others. Final rept on Contract AF 33(600)35031. Jan 59, 580p. 54 refs. AMC Technical rept. 59-7-589, vol. 2; AD-156 069, vol. 2.
Order from OTS $7.00 PB 151 803

Volume II contains the engineering details of the experimental work, all data, and their interpretations. (See also PB 151 802)

Rubber and Elastomers

Bureau of Ships, Washington, D. C.
STATISTICAL STUDY TO ESTABLISH CONVERSION CURVES FOR INSTRUMENTS MEASURING HARDNESS OF RUBBER: A STUDY OF MEASUREMENTS BY A. S. T. M. - OLSEN, REX AND SHORE "A" INSTRUMENTS ON A VARIETY OF ELASTOMER MATERIALS, by A. S. Marthens. 5 Feb 57, 40p. 3 refs. Rept. no. 373-2(61).
Order from LC mi$3.00, ph$6.30 PB 139 519

Burke Research Co., Van Dyke, Mich.
DEVELOPMENT OF OZONE AND/OR OXYGEN RESISTANT ELASTOMER COMPOUNDS, by F. C. Bruce, R. E. Isley and B. Hunt, Rept. no. 57 (Final) for 1 June 52-15 Apr 57 on Contract DA 20-089-ORD-36531. 1 Oct 57, 232p.
Order from LC mi$10.20, ph$36.30 PB 139 656

An extremely large amount of data has been developed. It is summarized with numerous tables and conclusions.

Institute of Rubber Research, U. of Akron, Ohio.
STRESS RELAXATION AND STRUCTURE OF HIGH TEMPERATURE ELASTOMERS, by Maurice Morton, V. R. Allen, and R. D. Gates. Technical rept. no. 1, 1 June-31 Aug 58, on Contract Nonr-2573(00). [1958] 9p. 7 refs.
Order from LC mi$1.80, ph$1.80 PB 140 880

The purpose of this project was to elucidate the mechanism of breakdown of high-temperature elastomers primarily by means of stress-relaxation studies.

[Material Lab] New York Naval Shipyard, Brooklyn.
ABSORPTION OF OXYGEN BY RUBBER: RESULTS OF RETEST OF REPRODUCIBILITY OF METHOD FOR MEASUREMENT OF. Final rept. 3 July 58, 3p.

5 refs. Lab. project 5759A.
Order from LC mi$1.80, ph$1.80 PB 139 523

Tabulation only.

Rock Island Arsenal Lab., Ill.
HEAT STABLE INHIBITORS FOR ELASTOMERIC VULCANIZATES, by Ronald R. Freeman. Technical rept., 5 Dec 58, 33p. 7 refs. Rept. no. 58-3359.
Order from LC mi$3.00, ph$6.30 PB 139 586

Results are presented on the evaluation of 63 commercial chemicals (inorganic, organic, and metallo-organic compounds) as heat stable inhibitors at temperatures up to 300°F in diene type vulcanizates. High concentrations (5-10 parts 100 rhc) of certain metallo-organic compounds, mainly metallic soaps, were found to improve the heat resistance of diene vulcanizates at 250°F and 300°F. Butadiene/styrene vulcanizates were only slightly improved in heat resistance upon air oven aging at 212°F, indicating that metallic soaps are more effective as anti-oxidants at the higher temperatures, i. e. Data are included on long term air oven aging of heat resistant vulcanizates based on butadiene/acrylonitrile, butadiene/styrene, polyisobutylene/isoprene, polychloroprene, polyacrylate and silicone polymers. A comparison is also presented of the heat resistance at temperatures of 212°F-300°F of butadiene/styrene vulcanizates cured with sulfur-accelerator, aliphatic sulfide-litharge, dicumyl peroxide and thiuram-thiazole accelerators.

Wood and Paper

Bureau of Ships, Washington, D. C.
STATISTICAL PLAN FOR PHASE I OF DESIGN CRITERIA FOR WOOD LAMINATES, by A. Lieberman. 22 July 57, 5p. Rept. no. 373-16(75).
Order from LC mi$1.80, ph$1.80 PB 139 510

The object was to determine the effect of lamination thickness on the strength of curved and straight wood laminates and to determine the effect of grain on the strength of curved and straight wood laminates.

Marine Lab., U. of Miami, Coral Gables, Fla.
MARINE BORER INVESTIGATIONS. Annual rept. for Jan-Dec 58 on Contract NOy-81879. Apr 58, 49p. 7 refs. 59-2.
Order from LC mi$3.30, ph$7.80 PB 140 841

Two broad avenues of investigation are pursued: studies to effect improved efficiency of coal tar creosote, and attempts to develop new and more effective chemical preservatives. Progress during the past year is summarized.

Timber Engineering Co., Washington, D. C.
BENDING RADII OF THREE THICKNESSES OF DENSE AND NON-DENSE TANALITH TREATED SOUTHERN YELLOW PINE, by W. J. Finnorn and N. Engalichev. Rept. on Contract NObs-72189. 5 Feb 59, 18p.
Order from LC mi$2.40, ph$3.30 PB 140 840

Dense and non-dense Tanalith-treated southern yellow pine boards of various thicknesses were placed in a Baldwin-Southwark Universal testing machine and subjected to bending in a dry, unheated state. The radii of curvature were determined by center-load static bending tests at the point of proportional limit as well as at the point of proportional limit as well as at the point of rupture. The results of this study indicated that the thickness of test specimens had a significant effect on the radii of curvature; namely, the thicker specimens reached proportional limit and point of failure in bending at considerably larger radii of curvature than similar thin specimens. Statistical analysis of test data indicated no significant difference between the dense and non-dense pine with respect to radii at proportional limit and at rupture. However, due to the variability of results and the relatively small number of specimens tested per variable, it cannot be definitely concluded that there is no difference between the two.

MATHEMATICS

ON PARABOLIC CONVERGENCE REGIONS FOR CONTINUED FRACTIONS, by W. J. Thron. Rept. on Contract AF 49(638)100. [1958] 13p. 9 refs. AFOSR TN-58-305; AD-154 216.
Order from LC mi$2.40, ph$3.30 PB 135 986

Applied Mathematics and Statistics Lab., Stanford U., Calif.
ON ELLIPTIC MONGE-AMPERE EQUATIONS AND WEYL'S EMBEDDING PROBLEM, by Erhard Heinz. Technical rept. no. 75 on Contract Nonr-225(11). 29 May 58, 97p. 33 refs.
Order from LC mi$5.40, ph$15.30 PB 139 645

Brown U. Div. of Engineering. Providence, R. I
ZEROS OF MODIFIED BESSEL FUNCTIONS OF IMAGINARY ARGUMENT, by V. Michael Papadopoulos Scientific rept. no. 10 on Contract AF 19(604)1391. June 58, 28p. 6 refs. Rept. AF 1391/10; AFCRC TN-58-104; AD-146 800.
Order from LC mi$2.70, ph$4.80 PB 137 259

For large values of $|s|$ in $|\arg s| < \pi/2$, Olver's derivation of uniformly valid asymptotic expansions is followed in order to find the expansion of the functions $K_{ip}(S)$, $I_{ip}(S)$ and $I_{ip}(S)$. The zeros of these functions for variable are determined, and in addition, the zeros of certain combinations of these functions which arise in pulse diffraction theory are found.

California U., Berkeley.
GENERALIZED GOURSAT PROBLEM FOR A HYPERBOLIC SYSTEM, by Robert P. Holten. Technical rept. no. 2 on Contract AF 49(638)398. Dec 58, 91p. 17 refs. AFOSR TN-58-1008; AD-206 151.
Order from LC mi$5.40, ph$15.30 PB 139 337

[Carnegie Inst. of Tech.] Pittsburgh, Pa.
DUAL METHOD OF SOLVING THE LINEAR PROGRAMMING PROBLEM, by C. E. Lemke. Doctoral thesis. Technical rept. no. 29 on Contract AF 33(616)294. 4 Mar 53, 24p. 6 refs. CIT-AF8A-TR 29; AD-14 424.
Order from LC mi$2.70, ph$4.80 PB 140 959

A method of solution of linear programing problems is presented which was developed from considerations of orthogonality and the dual theorem of Tucker, Kuhn, and Gale (Activity Analysis of Production and Allocation, Cowles Commission Monograph 13, Chap. 19, John Wiley and Sons, N. Y., 1951). The method involves a change from the point to the hyperplane as the fundamental geometric object.

Chicago U., Ill.
SIMPLICIAL TOPOLOGY I, by Saunders Mac Lane and Joseph Yao. Technical note on Research on Algebraic Mechanism of Fiber Spaces, Contract AF 18(600)1383. Mar 59, 45p. 6 refs. AFOSR TN-59-361; AD 213 671.
Order from LC mi$3.30, ph$7.80 PB 140 806

Columbia U., New York.
SYNTHESIS OF MARKOFF CHAINS, by Peter Frank. Rept. on Contract AF 18(600)442. 3 Sep 58, 7p. CU-44-58-AF 18(600)442-MS; AFOSR TN-58-809; AD-202 354.
Order from LC mi$1.80, ph$1.80 PB 136 874

Hebrew U. (Israel).
COERCIVENESS PROBLEM FOR INTEGRO-DIFFERENTIAL FORMS, by Shmuel Agmon. Technical note no. 5 on Contract AF 61(052)04. May 58, 72p. 4 refs. AFOSR TN-58-671; AD-162 203.
Order from LC mi$4.50, ph$12.30 PB 136 868

The solution of the problem of coerciveness for quadratic forms (not necessarily formally positive) over function classes defined by general boundary conditions is discussed. The general coerciveness theorem is given in which the bounded domains are considered for the sake of simplicity. A similar result holds for a wide class of unbounded domains. The general result depends on the corresponding coerviceness theorem in a half-space for forms with constant coefficients. This special case is further reduced, via the Fourier transform, to the problem of characterizing strongly coercive integro-differential forms with constant coefficients on the half-line. This method could be used to solve the general coerciveness problem for integro-differential quadratic forms over vector functions.

Hebrew U. (Israel).
RESEARCH IN THE AREA OF MATHEMATICAL ANALYSIS. Final technical rept. for 1 July 57-30 Sep 58 on Contract AF 61(052)04. Dec 58, 34p. 3 refs. AFOSR TR-58-111; AD-210 471.
Order from LC mi$3.00, ph$6.30 PB 139 616

Illinois U., Urbana.
FIXED POINTS AND OTHER SPECIAL POINTS AND POINT SETS UNDER MAPPING, by D. G. Bourgin. Rept. on Contract AF 18(603)32. 5 Jan 59, 51p. 12 refs. AFOSR TR-58-146; AD-205 093.
Order from LC mi$3.60, ph$9.30 PB 139 606

Institut für Angewandte Mathematik der Universität Hamburg (West Germany).
A DIFFERENTIATION TECHNIQUE FOR PARTIAL DIFFERENTIAL EQUATIONS WITH NON-LINEAR BOUNDARIES, by Julius Albrecht. [1957] 75p. AFOSR TN-57-139; AD-120 496.
Order from LC mi$4.50, ph$12.30 PB 136 190

Contents:
Finite difference method for elliptic differential equations for domians with curved boundaries
The finite difference method for parabolic and hyperbolic differential equations
A special Mehrstellen method

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
STUDY OF THE RESTRICTED RANDOM WALK, by R. Sherman Lehman and George H. Weiss. Rept. on Contract AF 18(600)1315. Nov 57, 27p. 22 refs. Technical note BN-115; AFOSR TN-57-735; AD-136 722.
Order from LC mi$2.70, ph$4.80 PB 137 257

This paper treats several aspects of the restricted random walk, both theoretically and numerically. It presents, for the first time, a study of the phenomenon of "trapping" in such random walks. A proof is given that such trapping must occur with probability one in most lattices. An ORDVAC study of this phenomenon shows that the number of survivors is very nearly an exponentially decreasing function of the number of steps. A further ORDVAC study of the mean square end-to-end distance of the restricted random walk is made, but sampling difficulties prevent definitive conclusions from being drawn.

Institute of Mathematical Sciences, New York, U., N. Y.
PERTURBATION OF CONTINUOUS SPECTRA AND SINGULAR INTEGRAL OPERATORS, by W. Koppleman and J. Pincus. Rept. on Contract DA 30-069-ORD-1258. Sep 57, 35p. 6 refs. IMM NYU-242; AD-145 006.
Order from LC mi$3.00, ph$6.30 PB 140 902

A study is presented of the problem associated with the perturbation of continuous spectra, where the perturbing operator is a singular integral operator. The special one-parameter family of operators is considered whose domains consist of the space $L^2(a, b)$ of square integrable functions $x(\lambda)$ defined on the interval (a, b) of the real axis of the complex plane. Investigation is made of this family of operators which is expressed as $L_\epsilon x(\lambda) = \lambda x(\lambda) + \frac{\epsilon}{\pi i} P \int_a^b \frac{x(\mu)}{\mu - \lambda} d\mu$ with the integral interpreted as a Cauchy principal value, and the assumption $\epsilon > 0$. The following problem is studied: Let L be the operator L_0 of the expression. This operator is symmetric and possesses a simple continuous spectrum which consists of the closed interval from a to b. Find bounded symmetric

operators K for which the perturbation $L+\epsilon K$ of the operator L causes a simple shift of the spectrum in a non trivial manner. A general estimate of the spectral shift for the perturbation is derived. Proof is given that in this case $\|K\| = 1$. From the spectral representation of the operator which is derived, L_ϵ is concluded to have a simple continuous spectrum which consists of the closed interval from $a-\epsilon$ to $b+\epsilon$. Thus the shift produced by the perturbation is essentially maximal. The spectral analysis of the expression is based upon an attempt to obtain an eigenfunction expansion for the operator L_ϵ. The work depends on the theory of singular integral equations.

Johns Hopkins U., Baltimore, Md.
ON SOLUTIONS OF $\Delta V + V$ 0 IN AN EXTERIOR REGION, by Philip Hartman. Technical rept. no. 8 on Contract AF 18(603)41. Nov 58, 13p. 6 refs. AFOSR TN-58-984; AD-205 914.
Order from LC mi$2.40, ph$3.30 PB 139 632

Michigan State U. [East Lansing].
AN INEQUALITY OF WEINBERGER AND BELLMAN, by Ingram Olkin. Interim technical rept. no. 11 on Contract DA 20-018-ORD-14735. 22 Sep 58, 5p. 1 ref.
Order from LC mi$1.80, ph$1.80 PB 137 173

Naval Ordnance Lab., White Oak, Md.
THE CAUCHY PROBLEM AND THE MIXED BOUNDARY VALUE PROBLEM FOR A NON-LINEAR HYPERBOLIC PARTIAL DIFFERENTIAL EQUATION IN TWO INDEPENDENT VARIABLES, by James Conlan. 7 May 58, 49p. 4 refs. NAVORD rept. 6107.
Order from LC mi$3.30, ph$7.80 PB 140 760

This paper proves existence theorems for the partial differential equation

$$u_{xy} = f[x, y, u(x, y), u_x(x, y), u_y(x, y)]$$

for the Cauchy problem and the mixed boundary value problem. The methods of proof are such as to lead directly to simple numerical methods for the construction of numerical solutions to these two problems.

Naval Proving Ground, Dahlgren, Va.
NEW FORMULAE FOR COMPUTING INCOMPLETE ELLIPTIC INTEGRALS OF THE FIRST AND SECOND KIND, by A. R. DiDonato and A. V. Hershey. 30 Jan 59, 38p. 12 refs. NPG rept. no. no. 1618; NAVORD rept. no. 5906.
Order from LC mi$3.00, ph$6.30 PB 139 499

New series expansions are developed for computing incomplete elliptic integrals of the first and second kind for large values of the amplitude and modulus The well known series, which are obtained after a binomial expansion of the integrands, are used for small values of the amplitude and modulus. The range of use of each series is so selected as to maintain a minimum of rounding error. A special criterion is used to determine when the binomial series should be terminated. The calculation of elliptic intergrals by these series is compared with the calculation by the previously established method, which has been developed by Legendre. The new series are more accurate and the average time of computation is 30% faster. The computing program in the NORC subroutine for the calculation of elliptic integrals is described.

Pennsylvania U., Philadelphia.
EQUICONTINUITY AND ALMOST PERIODIC FUNCTIONS, by Robert Ellis. Rept. on Contract AF 18(600)1116. 3 Nov 58, 12p. 7 refs. AFOSR TN-58-118; AD-152 026.
Order from LC mi$2.40, ph$3.30 PB 137 066

Let X be a separate uniform space, $C(X, X)$ the set of continuous functions of X into X, and $C(X)$ the set of real valued continuous functions on X provided with the topology of uniform convergence. For $f \in C(X)$ and $a \in C(X, X)$, fa will denote that element of $C(X)$ such that $(fa)(x) = f(xa)$ $(x \in X)$. Let $f \in C(X)$ and $A \subset C(X, X)$. Then f is said to be almost periodic with respect to A if $fA = [fa \mid a \in A]$ is a relatively compact subset of $C(X)$. In this paper the behavior of A is studied by means of its almost period functions. In particular it is shown that if there are enough of these, then A is equicontinuous.

Pennsylvania U., Philadelphia.
MINIMAL SETS: AN INTRODUCTION TO TOPOLOGICAL DYNAMICS, by W. H. Gottschalk. Rept. on Contract AF 18(600)1116. 30 Oct 58, 26p. 28 refs. AFOSR TN-58-314; AD-154 218.
Order from LC mi$2.70, ph$4.80 PB 137 067

A survey of some of the results, models, and problems of topological dynamics. For simplicity of presentation, attention is mostly confined to flows.

Princeton U., N. J.
THE THEORY OF CHARACTERISTIC CLASSES, by John Milnor and James Stasheff. Lecture notes on Contract AF 18(600)1494. 20 Jan 58, 29 refs. AFOSR TN-59-9; AD-208 281.
Order from LC mi$7.50, ph$24.30 PB 139 634

Purdue Research Foundation, Lafayette, Ind.
CONVOLUTION OPERATORS THAT SATISFY THE SPECTRAL THEOREM, by G. L. Krabbe. Technical note no. 6 on Some Spectral Mappings on the Space LP, Contract AF 18(603)44. 15 May 58, 28p. 18 refs. PRF-1297; AFOSR TR-58-65; AD-158 260.
Order from LC mi$2.70, ph$4.80 PB 139 564

University Coll., Cork (Eire).
CURVE FITTING AND INTEGRAL CURVES FOR NON-LINEAR DIFFERENTIAL EQUATIONS: A GENERALISED STEP-FUNCTION APPROACH, by Patrick M. Quinlan. Technical note no. 5 on Contract AF 61(514)1163. Sep 1163, 38p. 4 refs. AFOSR TN-59-65; AD-209 609.
Order from LC mi$3.00, ph$6.30 PB 139 604

Generalised step-functions are used to give a curve of any specified degree of continuity passing through specified points. The method is then extended so that

the slope and ordinate of the fitting curve are equal to those of a given curve, and finally a calculus is developed for matching both ordinate-slope and curvature at all points of regular subdivision by a generalised step function expression.

Virginia U., Charlottesville.
MAPPING AND SPACE RELATIONS, by Paul McDougle. Technical note on. 4 on Topology and Mathematical Analysis, Contract AF 49(638)72. July 58, 7p. 6 refs. AFOSR TN-58-704; AD-162 238.
Order from LC mi$1.80, ph$1.80 PB 137 346

Let f(X) = Y where X,Y are topological spaces and f is a continuous mapping. The following type theorem will be considered: Given assigned properties to X and f, what further property of f is equivalent to a specified property of Y. Known examples of theorems of this type are due to G. T. Whyburn [6: theorem 2.3], A. H. Stone [5: theorem 1], and the author [4]. This paper will establish some further examples, including some with more elementary space properties than have been previously considered.

Virginia U., Charlottesville.
ON THE EQUIVALENCE OF TWO COHOMOLOGY DIMENSIONS, by E. E. Floyd. Technical note no. 7 on Topology and Mathematical Analysis, Contract AF 49(638)72. July 58, 11p. 4 refs. AFOSR TN-58-705; AD-162 239.
Order from LC mi$2.40, ph$3.30 PB 137 349

Washington State Coll., Pullman.
RANK OF A MATRIX AND RENEWAL THEORY, by J. L. Brenner and George Weiss. Technical rept. no. 6 on Bounds for Determinants, Location of Characteristic Roots, Solution of Linear Equations, Contract DA 04-200-ORD-340 [1955] 10p. 6 refs.
Order from LC mi$1.80, ph$1.80 PB 136 734

Wisconsin U., Madison.
ESTIMATES FOR THE LENGTHS OF CERTAIN CLOSED GEODESICS ON A POLYHEDRON, by Laurence C. Young. Technical rept. no. 3 on Existence and Nature of Solutions in the Calculus of Variations with Special Reference to Parametric Double Integral Problems, Contract DA 11-022-ORD-1511. Nov 56, 10p.
Order from LC mi$1.80, ph$1.80 PB 136 713

The notion of a polyhedron refers, in this note, to a definite piecewise linear mapping x(u,v), into a corresponding Euclidean space, of a 2-dimensional pseudomanifold S derived from the unit square of the (u,v)-plane by the usual boundary identifications.

Wisconsin U., Madison.
MINIMAL PERIMETER OF A DISC EQUIVALENT TO A CLOSED POLYHEDRON, by Laurence C. Young. Technical rept. no. 4 on Existence and Nature of Solutions in the Calculus of Variations with Special Reference to Parametric Double Integral Problems, Contract no. DA 11-022-ORD-1511. Nov 56, 9p. 2 refs.
Order from LC mi$1.80, ph$1.80 PB 136 711

Wisconsin U., Madison.
PROPOSITION OF RIGID STATICS RELATED TO AREA AND TO THE CALCULUS OF VARIATIONS, by Laurence C. Young. Technical rept. no. 5 on Existence and Nature of Solutions in the Calculus of Variations with Special Reference to Parametric Double Integral Problems, Contract DA 11-022-ORD-1511. Dec 56, 18p. 6 refs.
Order from LC mi$2.40, ph$3.30 PB 136 712

The object of this note is to establish for bivectors in m-space, and in particular for bivectors in 4-space or what amounts to the same for forces and couples in 3-space, the existence of an appropriate polyhedron with a plane boundary, provided that the given bivectors have a bivector as their resultant. This polyhedron is made up of faces obtained by subdivision and translation from the triangles whose oriented areas represent the given bivectors, and by the addition if necessary of further triangles whose total area is arbitrarily small.

Computing Devices

Armour Research Foundation, Chicago, Ill.
AUTOMATIC DATA REDUCTION. PART I. A RESEARCH STUDY OF AUTOMATIC DATA RECORDING DEVICES, by Albert K. Hawkes. Rept. on Contract AF 33(616)2573. Nov 54, 43p. 7 refs. WADC Technical rept. 54-519, Pt. 1; AD-50 127.
Order from OTS $1.25 PB 111 927

Data recording requirements of the laboratories and test facilities at the Wright Air Development Center were investigated to determine the applicability of automatic data recording equipment as a means of solving mass data problems. Applications of available equipment are suggested where it was felt that such equipment would allow more efficient operation of the facilities. The primary considerations are accuracy, frequency response, preparation of data in a suitable form for calculation (IBM cards), and use of personnel. Since several of the separate test facilities have recording problems which no available equipment could solve, the need for research and development in these areas is evident. Probably the most needed piece of equipment is a replacement for the airborne oscillograph by either an FM tape recorder, or an airborne digital tape recorder rather than applying an analog to digital converter to the demodulated analog signal after playback. Such a device would need to have a frequency response of about 0 to 2000 c. Another difficulty arising is that of making analyses of analog waveforms where frequencies up to several thousand occur. It was recommended that this problem be given further investigation to determine the most efficient methods of carrying out harmonic analyses of analog waveforms where large amounts of data are concerned.

Catholic U. of America, Washington, D. C.
RESEARCH ON BARIUM TITANATE AND OTHER FERROELECTRIC MATERIALS FOR USE AS INFORMATION STORAGE MEDIA, by Charles F. Pulvari. Rept. on Magnetic and Electronic Materials, Contract AF 33(616)2934. Sep 58, 238p. 39 refs. WADC Technical rept. 58-657; AD-209 530.
Order from OTS $3.50 PB 151 835

The problem of stability in connection with switched polarization, generally denoted by workers in the field as "fatigue," "degradation," "decay," or "aging," etc., has been studied. Separation of skin and bulk properties in $BaTiO_3$ c-domain single crystals was accomplished experimentally as well as theoretically. Results are presented on improved $BaTiO_3$ crystals as well as on $BaTiO_3$ crystals with various impurity additions. Effect of impurities on electrical solid-state properties of $BaTiO_3$ is discussed. Preparation of triglycine sulfate (TGS) as well as tri-glycine fluoberyllate (TGFB) crystals is described with particular interest in their utilization as tape storage media. A phenomenological theory of polarization reversal in ferroelectrics was developed based on detailed investigation of $BaTiO_3$ c-domain single crystals. An ordinary ferroelectric storage condenser using avalanche electrodes arranged in a matrix configuration permits selection of an individual storage condenser in a matrix crosspoint so that unselected storage condensers are not affected by fractional pulses, whereby a total selection is achieved. This memory condenser enables the construction of a high-speed ferroelectric memory matrix. An analog to the transfluxor, —a transpolarizer—was developed and is described. This device permits the development of non-destructive read-out devices.

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
DESK CALCULATOR DETERMINATIONS OF HUMAN DYNAMICS, by Ezra S. Krendel and Harold L. Platzer. Final technical rept. on Research on Human Transmission Properties, Contract Nonr-1571(00). Oct 57, 29p. 4 refs. Rept. no. F-2490-1.
Order from LC mi$2.70, ph$4.80 PB 137 316

The possibility of computing describing functions and remnants for the study of human dynamics with relatively cheap digital equipment has been demonstrated and procedural aids furnished. These procedural aids simplify the hand calculation checkout of complex computing programs intended for high-speed digital machines. The selection of the sampling interval on the basis of the transport delay of the system as well as the Shannon sampling theorem has been discussed. Representative computations have been presented for a specific example.

General Electric Microwave Lab., Palo Alto, Calif.
MICROWAVE COMPUTER RESEARCH, by M. P. Forrer. Quarterly progress rept. on Contract Nonr-2127(00). 31 July 57, 43p. 7 refs. Rept. no. R57ELM79; AD-139 318.
Order from LC mi$3.30, ph$7.80 PB 136 999

A detailed analysis of mμsec pulse transmission was carried out using as a mathematical tool the Fourier transformation. Gaussian pulse envolpes were assumed as a reasonable approximation to physically realizable pulses. Pulse deterioration due to amplitudeand phase distortion (dispersion) was calculated and discussed.

Institute of Engineering Research, U. of California, Berkeley.
A MACHINE FOR COMPUTING CORRELATION FUNCTIONS, by James A. Harder. Rept. on Contracts Nonr-222(18) and Nonr-222(22). Aug 58, 12p. 4 refs. Series no. 61, issue no. 17.
Order from LC mi$2.40, ph$3.30 PB 140 765

Magnavox Co., Los Angeles, Calif.
THE RESEARCH AND DEVELOPMENT OF THE MAGNACARD SYSTEM, by Alfred M. Nelson. Rept. on Research and Design Studies for Large-Capacity Data Processing, Contract AF 33(616)3370. Sep 58, 187p. WADC Technical rept. 58-421; AD-211 694.
Order from OTS $3.00 PB 151 828

Methods for high-speed handling of magnetic cards including all necessary functions to permit automatic sorting, merging, selecting, filing, reading and writing were developed under the program. A special magnetic card was developed to provide a reliable unit document record. The research work covered in the report includes descriptions of the various approaches taken in each area of research effort. The selection of the final approach was made on the basis of the ultimate reliability obtained in each area of endeavor. The techniques developed utilized pneumatic means extensively. Vacuum drums were developed to transport magnetic cards at 300" per second. High-speed electrodynamic air valves were developed for the selective transfer operations that formed the basis of card sorting and selection functions. Card feed control was also accomplished pneumatically, and reversible stations capable of either feeding or stacking cards were devised. Reading and writing of information to provide storage of up to 1,000 decimal characters on the 1" x 3" card was accomplished.

National Cash Register Co., Dayton, Ohio.
RESEARCH ON AUTOMATIC COMPUTATION TECHNIQUES AND COMPONENTS, by W. M. Becker, R. W. Clark, and M. S. Hall. Rept. on Contract AF 33 33(616)3837. Dec 58, 176p. 61 refs. WADC Technical rept. 58-645; AD-206 668.
Order from OTS $3.00 PB 151 834

This report describes and summarizes three separate areas of research conducted under a single contract. All three phases are unclassified; classified portions of the work have been reported elsewhere. Part I presents the results of the engineering investigation of the implementation of a notation scheme which is to serve as the arithmetic unit of a digital computer. The principal problems were those of finding a method of operating magnetic core function matrices faster and more reliably than heretofore possible and to devise a way of operating large (10^6 bits) magnetic core matrices at high speeds without the necessity of redundant circuitry. Part II had as its objective the determination of processing methods which might lead to ferroelectric behavior suitable for computer device application through a study of vacuum evaporated barium titanate films. Problems encountered in the formation of thin films of ferroelectric material other than barium titanate are discussed. Part III had as its objective the making of a fast electro-optical switch for logic circuitry in digital data processing systems by using the optimum combination of polycrystalline electroluminescent (EL) and photoconductive (PC) materials. ZnS-type EL phosphors and CdS, CdSe,

and PbS PC materials were investigated. The following problems were considered: (1) the effects of the dielectric characteristics of the embedment on the properties of an EL layer; (2) the spectral emission of the EL materials and the spectral sensitivity of the PC materials; and (3) the speed of response of the EL layer and the PC element.

Naval Ordnance Lab., Corona, Calif.
DART PROJECT, by L. P. Meissner and E. O. Codier. Final rept. 19 May 59, 59p. 2 refs. NOLC rept. 444, supersedes NOLC 172; NAVORD-5946.
Order from OTS $1.50 PB 151 773

DART (Differential Analyzer, Real Time) is a computing system that possesses the inherent speed of an analog computer and the basic accuracy of a digital computer. Information in two forms, pulse-trains and sets of "static" gating voltages, is processed by a number of digital computing elements of different types which are interconnected in the manner of analog computing elements in order to solve a set of differential equations. The system is described from a mathematical viewpoint, and the construction of the hardware is explained in detail. Some comments are made concerning inherent errors and suggested improvements for future development.

Naval Research Lab., Washington, D. C.
A REACTOR CODE FOR THE NAREC, by S. Podgor and L. A. Beach. 26 May 59, 11p. 8 refs. NRL rept. 5318.
Order from LC mi$2.40, ph$3.30 PB 139 727

A few-group, multiregion, one-dimensional reactor code has been prepared for the Naval Research Laboratory Electronic Digital Computer (Narec). It applies to slab, cylindrical, and spherical geometries. For any geometry and material composition, the calculation gives (a) the multiplication constant, (b) the spatial flux distribution for each energy group, and (c) the spatial source distribution. Calculations of two critical arrangements of the Naval Research Reactor are described. Comparison of calculated and experimental results indicates that they are within five percent of each other or better.

Nevis Cyclotron Labs., Columbia U., Irvington-on-Hudson, N. Y.
USE OF AN IBM TO CALCULATE CLOUD CHAMBER EVENTS, by R. Bingham, D. Tycko, and L. Mc Dermott. Rept. on Contracts N6ori-110(01) and AT(30-1)1932. Nov 57, 28p. R-191; CU-154-57-ONR-110-Physics; Nevis-59.
Order from LC mi$2.70, ph$4.80 PB 136 771

This report was previously announced in USGRR, v. 32, no. 2, with the incorrect PB number.

Office of Naval Research, Washington, D. C.
STATUS OF DIGITAL COMPUTER AND DATA PROCESSING DEVELOPMENTS IN THE SOVIET UNION: DATA PROCESSING SEMINAR PROCEEDINGS, WASHINGTON, D. C., NOVEMBER 12, 1958, Apr 59, 179. 58 refs. ONR Symposium rept. ACR-37.
Order from OTS $3.00 PB 151 634

Packard-Bell Computer Corp. Los Angeles, Calif.
CONVERTER, ANALOG-TO-DIGITAL, DIGITAL-TO-ANALOG, CV-710/U. Final engineering rept. on Contract NObsr-72763. [1958] 69p.
Order from LC mi$3.90, ph$10.80 PB 140 851

This report describes a device which receives a voltage input and generates a proportional binary number as an output. As the input varies, the digital number is changed; 3 types of changes occur: increment, decrement, or no change. The changes are also available as putput. A reverse mode of operation receives a serial binary number as an input and generates a proportional voltage as an output. The device is described in considerable detail.

Skiatron Electronics and Television Corp., New York.
EXPERIMENTAL AND THEORETICAL STUDY OF DARK TRACE CRT STORAGE. Final rept. on Contract AF 19(604)2645. 25 Nov 58, 193p. Rept. no. 201-203; AFCRC-TR-58-361; AD-208 401.
Order from LC mi$8.70, ph$30.30 PB 139 603

A dark trace digital storage technique has been investigated and studied under Contract AF19(604)-2645, in order to determine and establish the basic workability of this new and novel approach to cathode ray tube (CRT) storage. Storage of binary data is effected by writing combinations of a "disc" and a "ring" on the potassium chloride screen, which exhibits practically indefinite persistence. Readout is effected by using the same electron beam for a very much shorter duration to "read" through the same spot with the result that the two varieties of written bits are distinguished by the resulting level of the fluorescence as detected by a photoelectric cell (PEC). A breadboard system utilizing the above approach has been demonstrated. This technique hold promise of being further improved to the point where it is decidedly competitive with regard to size, weight, and cost per storage capacity, and is capable of operating at much faster speeds than the several milliseconds for writing, and several microseconds for reading, presently employed in the original breadboard setup.

Washington U., Seattle.
NON-SYMMETRIC CORRELATION MATRIX PROGRAM FOR THE IBM TYPE 650, by August Dvorak and Calvin E. Wright. Rept. on Contract Nonr-477(08). May 58, 6p. 2 refs.
Order from LC mi$1.80, ph$1.80 PB 139 636

This program will compute non-symmetric correlation coefficient matrices up to order 20 by 40 with the means, standard deviations, and variances for all the variables. All the correlation coefficients are in four decimals, the variances in four decimals more than the input, and the means and standard deviations in three decimals more than the input.

Battelle Memorial Inst., Columbus, Ohio.
THE COMPRESSIVE CREEP BUCKLING OF METAL COLUMNS. PART VI. EFFECT OF INITIAL IMPERFECTION, by Alfred Rudnick, Robert L. Carlson, and George K. Manning. Rept. for 1 Apr 57-1 Mar 58 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)3317. Oct 58, 51p. 14 refs. WADC Technical rept. 52-251, Pt. 6; AD-202 491.
Order from LC mi$3.60, ph$9.30 PB 140 907

Columns with initial imperfections ranging from $\frac{L}{1000}$ to $\frac{L}{70}$ (where L is the column length) were tested at temperatures of 750, 850, and 900 F. A signigicant interrelationship was found to exist between column load, lifetime, temperature, and imperfection, i.e., the effects of any one factor are dependent upon the magnitudes of the other factors. (See also PB 151 218)

Battelle Memorial Inst., Columbus, Ohio.
A METALLURGICAL STUDY OF MOLYBDENUM, by Robert M. Parke. Quarterly rept. no. 8, 1 Feb-30 Apr 51, on Contract N9onr-821(00). 1 May 51, 89p. 1 ref. AD-156 818.
Order from LC mi$4.80, ph$13.80 PB 140 847

The concentrations of Ni, Mn, Cr, O, H, and N in cast Mo are lowered by vacuum fusion, while Cl is kept below 0.003%. Those elements which impair the ductility of the cast Mo are subjects of interest. The reduction of $MoCl_5$ to produce samples of high-purity Mo does not appear as attractive as the vacuum-fusion method. Gradient composition ingots were prepared in all the alloy systems under test for oxidation resistance; each of the alloys behaves in a different manner when arc melted. The comparison of Mo from different sources by high-temperature creep-rupture testing was completed. Greater ductility and lower rupture strength were exhibited by wrought arc-cast Mo in an H atmosphere as compared with vacuum tested specimens. Procedures are described for measuring the solubility of O in Mo which are believed feasible up to 3000°F. Quench aging occurs in Mo quenched from 3800°F, and takes place at room temperature over a period of at least 2 mo.

Brigham Young U., Provo, Utah.
THE NATURAL FREQUENCIES OF CERTAIN VIBRATING RECTANGULAR PLATES, by Norman R. Woodfield. Master's thesis. Rept. on Contract DA 04-495-ORD-560. Apr 57, 40p. 18 refs.
Order from LC mi$3.00, ph$6.30 PB 137 281

A general solution is found for the natural frequencies of a vibrating thin rectangular plate with edges simply supported or with all edges clamped. A list of expressions for characteristic equations, second and fourth derivatives and a normalizing factor are compiled for the vibrating beam problems with ends clamped or ends clamped and supported.

Columbia U., New York.
ON STRESS INTERACTION IN FATIGUE AND A CUMULATIVE DAMAGE RULE. PART I. 2024 ALUMINUM AND SAE 4340 STEEL ALLOYS, by Alfred M. Freudenthal and Robert A. Heller. Rept. for 15 June 56-13 Jan 58 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)3982. June 58, 53p. 30 refs. WADC TR-58-69, Pt. 1; AD-155 687.
Order from LC mi$3.60, ph$9.30 PB 140 816

The effects of stress-interaction, under randomly varied exponentially distributed stress amplitudes representing gust and maneuver loads on aircraft wings, on the fatigue life of smooth 2024 aluminum and SAE 4340 steel alloy specimens. On this basis a quasi-linear cumulative damage theory supported by numerous test results is developed.

Cornell U., Ithaca, N. Y.
FURTHER REMARKS ON USE OF PROBABILITY IN CLASSICAL STATISTICAL MECHANICS, by M. Kac. Rept. no. 52 on Contract AF 18(600)685. July 56, 10p. 1 ref. [AF] OSR-TN-56-321; AD-94 857.
Order from LC mi$1.80, ph$1.80 PB 136 991

Previous work on the use of probability in classical statistical methods is continued. The model is modified sto that the number of elements in the set is not fixed but is a random variable with a mean. The treatment is analogous to a treatment by means of a grand-canonical ensemble. A purely probabilistic approach is introduced and justified on the basis of the Liouville equation, with a restriction to symmetric initial distributions. Symmetrization is explained, and an analogy is made with kinetic theory.

Illinois U., Urbana.
THE EFFECT OF SIZE AND NOTCH SENSITIVITY ON FATIGUE CHARACTERISTICS OF TWO METALLIC MATERIALS; PART I, ALUMINUM ALLOY 75S-T; PART II, S.A.E. 4340 STEEL, by H. F. Moore, T. J. Dolan and B. C. Hanley. Final rept. on Contracts W33-038-ac-9225 and W33-[038]-ac-14712; Progress rept. no. 6 on Contract N6ori-71(04). 5 Oct 48, 161p. 18 refs. AF Technical rept. 5726; ATI-36 961.
Order from LC mi$7.80, ph$25.80 PB 140 862

Size effect and notch sensitivity on fatigue characteristics of high strength aluminum alloy 75S-T6, and S.A.E. 4340 alloy steel heat-treated to 160,000 psi. Reversed bending data indicate a decrease of fatigue properties with an increase in size of test specimen within the range investigated (1/4 to 1-7/8 inch diameter). The notch sensitivity in bending of the aluminum alloy and heat-treated 4130 steel shows a tendency to decrease with increase in size, but 4340 tends to increase with increase in size.

Naval Engineering Experiment Station, Annapolis, Md.
AN EVALUATION OF A THERMENOL CASTING, by W. J. Greenert. 23 Sep 55, 14p. 2 refs. Evaluation rept. 040038C(2).
Order from LC mi$2.40, ph$3.30 PB 140 855

A commercial casting of Thermenol, a 16% aluminum - 3% molybdenum - iron base alloy, was evaluated and structurewise was found to be unsuitable for superheater tube support plate applications. Severe casting flaws and a large columnar grained metal structure were primary causes for poor mechanical characteristics of this casting. Special tests showed that the Thermenol alloy is more resistant than 25-20 Cr-Ni steel to vanadium induced accelerated oxidation.

Polytechnic Inst. of Brooklyn, N. Y.
CREEP DEFORMATIONS OF RECTANGULAR FRAMES, by Francis W. French, Jr. Sharad A. Patel, and N. J. Hoff. Rept. on Contract AF 18(600)1381. July 57, 32p. 3 refs. PIBAL rept. no. 340; AFOSR TN-57-714; AD-136 707.
Order from LC mi$3.00, ph$6.00 PB 137 175

Experiments are described in which rectangular frames of 5052-0 aluminum alloy were subjected to loads at 500°F. The displacement velocities were measured and compared to the results of theoretical analysis. In the calculation the effects of the rigid end fittings, of the beam-column action, and of simultaneous elastic and steady creep deformations were taken into account while primary creep was disregarded.

University Coll., Cork (Eire)
VIBRATION OF BEAMS: A RECURRENT APPROACH, by Patrick M. Quinlan. Technical note no. 6 on Contract AF 61(514)1163. Sep 58, 37p. AFOSR TN-59-118; AD-210 423.
Order from LC mi$3.00, ph$6.30 PB 139 617

A new method is presented for obtaining the frequencies of vibration of a loaded beam. The usual frequency determinant is by-passed, and the frequency equation is obtained by the multiplication of two sets of polynomials. Thus the higher critical frequencies can be obtained as readily as the lowest frequency, an advantage not possessed by any existing method.

Aerodynamics and Pneumatics

Air Force Missile Development Center, Holloman AFB, N. Mex.
DEFLECTION OF THE HOLLOMAN TRACK UNDER STATIC LOAD, by Frank J. Calkum and Ray L. Larkins. Mar 59, 19p. AFMDC-TN-59-2; AD-209 778.
Order from LC mi$2.40, ph$3.30 PB 139 631

During November and December of 1958, measurements were made of the deflection of the AFMDC track under a static load of one hundred thousand pounds (approximately five times the weight of present day sleds) which was applied to the track at two adjacent tie-down points. Deflection of the rails was recorded along the track from the load points to a point at which no deformation could be measured by the most precise survey methods. Subsequent observations were made at the same observation points to determine the rate of settlement under static load and the rate of recovery after removal of the load. Under the influence of the load a maximum deflection of .05 inch was observed. The deflection was smaller than .005 inch at a distance 24 feet from a load point. Recovery after the removal of the load was slow and incomplete.

Aircraft Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
REMARKS ON THE THEORY OF WIND TUNNELS WITH SLOTTED WALLS, by Gottfried Guderley. Jan 52, declassified 8 May 56, 51p. 5 refs. WADC Technical rept 52-8; AD-6213
Order from LC mi$3.60, ph$9.30 PB 140 818

Two-dimensional wind tunnels with slots in longitudinal and in lateral directions are investigated by the method of characteristics and analytically. For the treatment of longitudinal slots by means of the method of characteristics, the flows in the slots and in the tunnel are considered as planar. At the slot entrance, these flow patterns are connected to each other by conditions derived from the continuity and momentum equations.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
FLUCTUATION MEASUREMENTS IN SUPERSONIC TURBULENT BOUNDARY LAYERS, by Alan L. Kistler. Aug 58, 46p. 10 refs. BRL rept. no. 1052.
Order from LC mi$3.30, ph$7.80 PB 139 662

The fluctuations in a turbulent boundary layer without pressure gradient or heat transfer have been measured with a hot wire anemometer for Mach numbers up to 4.6. The distribution of the static temperature fluctuation levels through the boundary layer is similar at the various Mach numbers, and the levels are proportional to the mean static temperature difference across the boundary layer. A slight decrease of the velocity fluctuation levels is observed as the Mach number is increased. There is a high negative correlation between the velocity and temperature fluctuations at all Mach numbers.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
SUPERSONIC DRAG AND BASE PRESSURE OF A 70° CONE CYLINDER, by G. D. Kahl. Nov 58, 40p. Memo. rept. 1178.
Order from LC mi$3.00, ph$6.30 PB 139 542

Experimental supersonic free flight measurements are presented of the drag experienced by a 35° half-angle cone cylinder in fluid media of various physical properties. Measurements as high as Mach 7.5 were made possible by lowered fluid temperatures. Drag coefficients observed in N_2 at 85°K agreed well with those found in air at 300°K at the same Mach number. Very little Reynolds number influence on total drag coefficient is noticed for this relatively short model over the Reynolds numbers tested ($[.5 < Re < 7] \times 10^6$). Base pressure coefficients derived from this data generally agree (except at Mach numbers less than 2) with wind tunnel and free flight data found by other observers using more slender cone cylinders. The base pressure coefficients tend to follow a linear relation with reciprocal of Mach number.

Defense Research Lab., U. of Texas, Austin.
TURBULENT BOUNDARY-LAYER AND SKIN-FRICTION MEASUREMENTS ON A SMOOTH, THERMALLY INSULATED FLAT PLATE AT SUPERSONIC SPEEDS, by W. H. Shutts, W. H. Hartwig, and J. E. Weiler. Final rept. on Contract NOrd-9195. 5 Jan 55, 115p. 18 refs. DRL-364; CM-823; AD-128 241.
Order from LC mi$6.00, ph$18.30 PB 137 046

Mean and local turbulent skin friction coefficients for a smoth flat plate were experimentally determined over a Mach Number range of 1.62 to 2.50 and a Reynolds Number range of 3.5×10^6 to 2×10^7. Two experimental methods were employed in the tests. Pitot-probe boundary layer surveys, and direct measurements of local shear force by means of small skin friction balances were employed simultaneously. The results from these two methods were compared on a direct drag basis and it was found that the results from the local shear force measurements were, in general, a few percent lower than those obtained from the Pitot-probe measurements.

Florida U., Gainesville.
PROCEEDINGS OF THE FLORIDA CONFERENCE ON HIGH-SPEED AERODYNAMICS AND STRUCTURES, VOL. 1, HELD JANUARY 21-24, 1957, pub. by Martin Co. 210p. .5 refs. ARDC TR-57-46, vol. 1; AD-113 003.
Order from OTS $3.50 PB 151 538

Technical papers on the mechanical and thermal properties of aircraft structural materials for use at elevated temperatures.

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The effects of dissociation and ionization on hypersonic couette flow, by H. W. Liepmann and Z. O. Bleviss
A new method for providing continuous high-temperature air flow for hypersonic research, by A. Hertzberg and R. Weatherston
Temperature distributions in composite structures, by J. F. Lundeberg
Design requirements and laboratory simulation of the kinetic heating of aircraft structures, by J. W. Taylor
The estimation from simple tension data of creep rupture characteristics in the presence of initial complex stress gradients, by J. W. Freeman, H. R. Voorhees
Effect of prior creep on mechanical properties of aircraft structural metals, by J. V. Gluck, H. R. Voorhees, and J. W. Freeman
Materials evaluation and design criteria, by G. Sachs and K. N. Tong
Mechanical property data requirements for new weapons systems, by D. A. Shinn and R. F. Klinger
Thermal property data requirements for new weapons systems, by J. I. Wittebort
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Simplified equations for calculating local and total heat flux to non-isothermal surfaces, by E. R. G. Eckert, J. P. Hartnett and R. Eichhorn
A procedure for calculating the boundary-layer development in the region of transition from laminar to turbulent flow, by J. Persh
Effects of extreme surface cooling on boundary-layer transition, by J. R. Jack, N. S. Diaconis and R. J. Wisniewski

Gas Turbine Lab., Mass. Inst. of Tech., Cambridge.
A THEORETICAL AND EXPERIMENTAL INVESTIGATION OF THE AEROTHERMOPRESSOR PROCESS, by Alve J. Erickson. Rept. on Aerothermopressor Project, Contract N5ori-07878. May 58, 188p. 31 refs.
Order from LC mi$8.40, ph$28.80 PB 140 917

An investigation was made of the effect on the stagnation pressure of injecting liquid water into a hot flowing gas stream (the Aerothermopressor process). Two Aerothermopressors (one 2.125 inches in diameter and six feet long, the other 11 inches in diameter and seven feet long) were used in the experimental investigation. A one-dimensional theoretical model accounting for heat transfer, mass transfer, wall friction, area change and drag of water droplets was formulated and refined. The theory predicted the experimental results extremely well except in regions of large deviations from one-dimensional flow such as exist in the diffuser and across shock waves that cannot be adequately described as normal shocks. The importance of having a variable-area Aerothermopressor is shown and a method is presented to determine the optimum area variation. The size effect of the Aerothermopressor is also demonstrated which shows that the larger the duct diameter is, the greater can be the increase in stagnation pressure.

Illinois U., Urbana.
DEFLECTIONS OF NON-HOMOGENEOUS ANISOTROPIC ELASTIC PLATES SUBJECTED TO HEATING, by H. L. Langhaar, R. E. Miller and A. P. Boresi. Technical rept. no. 3 on Contract Nonr-1834(14). Aug 58, 32p. 8 refs. T & AM rept. no. 136.
Order from LC mi$3.00, ph$6.30 PB 140 903

The Kirchhoff and von Kármán theory of moderately large deflections of flat elastic plates is generalized by the inclusion of thermal effects and by elimination of the requirements of isotropy and homogeneity. The buckling of an isotropic circular plate due to variable axially symmetrical radial stresses is treated by the eigenvalue theory.

Institute for System Research, U. of Chicago, Ill.
AERODYNAMIC STUDIES: THE FORCES ACTING ON AN AIR VEHICLE: A REVIEW OF THE LITERATURE [PARTS 6-8] by M. Z. Krzywoblocki. Repts. on Scientific Engineering Research Investigations in Flight Dynamics, Contract AF 33(616)5689. Oct-Nov 58, 4 nos. WADC Technical note 56-360, Pts. 5-8. AD-161 008-AD-161 011.
Order from OTS

Pt. 5, Jan-Mar 53, reissued Oct 58, 115p. 445 refs.
AD-161 008, PB 151 815, $2.50
Pt. 6, Dec 53, reissued Oct 58, 142p. 1187 refs.
AD-161 009, PB 151 816, $2.75
Pt. 7, July-Sep 53, reissued Oct 58, 96p. 545 refs.
AD-161 010, PB 151 817, $2.25
Pt. 8, Oct-Dec 53, reissued Nov 58, 96p. 373 refs.
AD-161 011, PB 151 818, $2.25

This work is an annotated bibliography of the scientific literature pertaining to methods of calculating the aerodynamic forces acting on an air vehicle in flight. The more interesting papers and reports (from the viewpoint of the aerodynamicist) are discussed briefly; others are listed without comment.

Institute for System Research, U. of Chicago, Ill.
AERODYNAMIC STUDIES: THE FORCES ACTING ON AN AIR VEHICLE: A REVIEW OF THE LITERATURE [PARTS 10-11] by M. Z. Krzywoblocki. Repts. on Scientific Engineering Research Investigations in Flight Dynamics, Contract AF 33(616)5689. Dec 58, Jan 59, 2 nos. WADC Technical note 56-360, Pts. 10-11; AD-161 013-AD-161 014.
Order from OTS

Pt. 10, Apr-June 54, reissued Dec 58, 128p. 451 refs.
AD-161 013, PB 151 820, $2.75
Pt. 11, July-Sep 54, reissued Jan 59, 110p. 339 refs.
AD-161 014, PB 151 821, $2.50
(See also PB 151 815-PB 151 818)

Institute of Engineering Research, U. of California, Berkeley.
THE MOMENTUM INTEGRAL METHOD APPLIED TO THE COMPRESSIBLE BOUNDARY LAYER WITH A SLIP BOUNDARY CONDITION, by J. A. Laurmann. Rept. on Contract Nonr-222(45). 20 Aug 58, 21p. 8 refs. HE-150-160; Series no. 20, issue no. 122.
Order from LC mi$2.70, ph$4.80 PB 140 767

A simple Polhausen type solution has been given for the two dimensional boundary layer equations for a flat plate with slip, and the Stewartson transformation has been used to obtain approximately the effect of compressibility. The theory, when used to compute induced pressures, yields results that give the correct trend when compared with experiment, namely a reduction of the induced pressure effect as compared with the no-slip case for large values of the parameter $M^2_{\infty} / \sqrt{Re_{\infty x}}$.

Massachusetts Inst. of Tech., Cambridge.
SUBLIMATION MASS TRANSFER THROUGH COMPRESSIBLE BOUNDARY LAYERS ON A FLAT PLATE by Thomas K. Sherwood and Olev Trass (Doctoral thesis). Final rept. on Contract AF 49(638)234. 1 Sep 58, 333p. 129 refs. AFOSR TR-58-131; AD-203 713.
Order from LC mi$11.10, ph$51.60 PB 137 179

Data are reported on rates of mass transfer from a flat plate to air at speeds up to Mach 3.5. These data extend the range of the present knowledge of mass transfer and provide a means of checking compressible flow theories. By use of heat, mass, and momentum transfer analogies, these experimentally determined mass transfer data can be used to estimate local friction and heat transfer coefficients under similar conditions. This provides a relatively simple method for obtaining local friction coefficients. Naphthalene was sublimed from an adiabatic sharp-edged flatplace model exposed to subsonic and supersonic air streams in a continuous-type wind tunnel. The resulting profiles of naphthalene thickness decrease gave a continuous sequence of point mass transfer coefficients in the laminar region, through the transition zone, and in the turbulent region. Thus, continuous local friction coefficients over these flow regimes as well as an accurate demarcation of the transition zone could be obtained.

Oklahoma U. Research Inst., Norman.
AN INVESTIGATION OF EXACT SOLUTIONS FOR TWO-DIMENSIONAL STEADY IRROTATIONAL ISENTROPIC FLOW OF A POLYTROPIC GAS, by Gustavus J. Simmons. Master's thesis. Technical rept. on Contract Nonr-982(02). 15 Aug 58, 106p. 38 refs.
Order from LC mi$5.70, ph$16.80 PB 140 864

The purpose of this thesis was the production of further exact solutions to the flow equation. These solutions have been formed as polynomials in a velocity co-ordinate multiplied with a function of the angular position.

Polytechnic Inst. of Brooklyn, N. Y.
DEVELOPMENT OF THE POLYTECHNIC INSTITUTE OF BROOKLYN HYPERSONIC FACILITY, by Antonio Ferri, Paul A. Libby and others. Rept. on Wind Tunnel Studies, Contract AF 33(616)17. Nov 55, 36p. 11 refs. WADC Technical note 55-695; AD-89 094.
Order from LC mi$3.00, ph$6.30 PB 140 958

The Polytechnic Institute of Brooklyn hypersonic facility is based on a two stage heating system. The first stage is a storage or convection heater of advanced design. The second stage is a compression heater in which the pressure and temperature of the air previously heated at low pressure in the convection heater are raised. In this report the major considerations involved in the heating system design are reviewed along with the results of the convection heater calibration and of preliminary tests with the compression heater. Also presented are a review of hypersonic nozzle design problems, a discussion of the general arrangement of the facility and plans for utilization in the near future.

Rome U. (Italy).
SOME CONTRIBUTIONS TO THE HEAT CONDUCTION AND THERMAL STRESSES ANALYSIS IN AIRCRAFT AND MISSILE STRUCTURES, by Luigi Broglio. Technical note no. 4 on Contract AF 61(514)888. Aug 58, 55p. 12 refs. SIARgraph no. 40; AFOSR TN-58-1006; AD-206 149.
Order from LC mi$3.60, ph$9.30 PB 139 615

This paper contains some of the results obtained in connection with Contract AF 61(514)-888, sponsored by A.R.D.C. The subject of the paper is the analysis of temperature distribution for bodies subjected to kinetic heating and heat losses by radiation, also in

the case of boundary conditions depending upon time and upon surfact temperature distributions. In Part I I, the simple solution for the concentrated heat source in a heterogeneous body of whatever shape is found. Part II deals with the solution of typical problems. Part III contains numerical applications and results, including also evaluation of thermal stresses for the hollow hemisphere. Tables and graphs complete the work.

Southwest Research Inst., San Antonio, Tex.
A SURVEY AND STUDY OF THE FACTORS WHICH AFFECT THE DUST ENVIRONMENT CREATED BY A VEHICLE OPERATING OVER UNSURFACED TERRAIN, by Carl A. Hafer. Rept. on Contract DA 23-072-ORD-1210. Sep 58, 70p. 62 refs.
Order from LC mi$3.90, ph$10.80 PB 139 668

The purpose of this program was to make a survey and study, from a theoretical viewpoint, of the various factors which affect the dust environment created by a vehicle operating over unsurfaced terrain. It was found, theoretically, that the air-flow pattern and the magnitude of the air flow about an operating vehicle have the greatest effect on the dust plume, whereas mechanical movement of soil (dust) particles aid only in introducing the particles into the air stream. The mechanical movement of particles is primarily the result of wheel or track slip. Various aspects of dust particle behavior necessitated the study and interpretation of published literature associated with biological aerosols rather than actual dust particles generated in the field. The mechanics of particle movement in air is presented.

Stanford U., Calif.
BENDING THEORY FOR SHELLS OF REVOLUTION SUBJECTED TO NONSYMMETRIC EDGE LOADS, by W. Flugge and F. A. Leckie. Rept. on Contract Nonr-225(16). 15 Nov 57, 99p. 5 refs. Div. of Engineering Mechanics Technical rept. no. 113.
Order from LC mi$5.40, ph$15.30 PB 136 704

The problem to be considered in this work is that of an arbitrary shell of revolution subjected to non-axially-symmetric edge loadings, and hence interest will be limited to the homogeneous bending equations. By separation of variables the problem is reduced to the solution of an eighth order ordinary homogeneous differential equation.

University of Southern California. Engineering Center, Los Angeles.
ADDITION OF HEAT TO A GAS THROUGH ELECTRICAL DISCHARGE, by Raymond L. Chuan. Rept. on Contract AF 40(600)736. May 59, 21p. 4 refs. AEDC-TN-59-51; AD-215 022.
Order from LC mi$2.70, ph$4.80 PB 140 774

The basic mechanisms present in a gaseous discharge and the subsequent decay are examined with the view towards applying these to heating a gas used for aerodynamic experiments. For the study of the thermodynamics and fluid mechanics of the flow of a partially ionized gas, the energy release due to decay processes is treated as a heat source moving with the gas, the source strength being related to the rate of decay of the energetic states of the excited molecules. The effects of the relaxation heating of the gas through the decays on the thermodynamics and dynamics of the gas flow are examined.

University of Southern California. Engineering Center, Los Angeles.
ONE-DIMENSIONAL FLOW OF A DECAYING NITROGEN PLASMA, by James C. Williams. Rept. on Contract AF 40(600)736. May 59, 41p. 13 refs. AEDC-TN-59-50; AD-215 021.
Order from LC mi$3.30, ph$7.80 PB 140 773

By postulating the decay process which is expected in a decaying nitrogen plasma it is possible to formulate the equations of one-dimensional motion of such a plasma. In the postulated decay process the recombination of ionized nitrogen acts as an internal heat source within the gas flow. The equations of motion for such a decaying plasma are both non-linear and coupled so that exact analytic solutions for the equations are practically impossible. By making certain restrictive assumptions, however, a solution is obtained which yields some quantitative insight into the decay of a nitrogen plasma in a constant area duct. The results of this analysis indicate that the decay of the nitrogen plasma is very slow, requiring an extremely long time for completion. Apart from the long decay time, the effects of nitrogen decay heating on the gas flow are no different from those of any other heat addition process.

Hydrodynamics, Hydraulics, and Hydrostatics

AER, Inc. [Pasadena, Calif.]
THE HYDROELASTIC PROBLEM FOR THE KNIFE EDGES AT THE ENTRANCE SECTION OF HME WATER BRAKE INTAKE DUCTS, by A. J. A. Morgan. Rept. for Oct 55-Jan 56 on Contract N123-60530S-4595A. Jan 59, 39p. NOTS TP-2209; NAVORD rept. no. 6518.
Order from LC mi$3.00, ph$6.30 PB 140 748

A preliminary attempt at analyzing the hydroelastic problem for the knife edges at the entrance sections of the intake ducts of rocket-test-sled water brakes is made. The pressure distributions acting over the surfaces of the knife edges are determined by assuming that the flow is two-dimensional and, to admit the use of a perturbation procedure, the knife-edge angles are assumed to be small (0 deg to 20 deg, say). These pressure distributions are then used to determine the shear load and bending moment distributions on the knife-edge structure (also assumed to be two-dimensional) and these, in turn, are employed in conjunction with simple beam theory to determine the deflections and stresses due to bending. The exact potential-flow pressure distribution over the knife edge is determined (without restriction to small angles). The results given by the analysis are conservative. Two examples are worked out, and design charts are included.

AER, Inc. [Pasadena, Calif.]
SOME POSSIBILITIES FOR SECURING A SMOOTH WATER SURFACE IN THE SNORT WATER TROUGH, AND AN APPRAISAL OF THE WATER-SURFACE SMOOTHING DEVICES, by T. Y. Wu and P. L. Leung. Rept. for July-Dec 55 on Contract N123-60530S-4594A. Jan 59, 46p. 8 refs. NOTS TP-2210; NAVORD rept. 6519.
Order from LC mi$3.30, ph$7.80 PB 140 753

Brown U. Div. of Applied Mathematics, Providence, R. I.
THE OSCILLATIONS OF A VISCOUS LIQUID GLOBE WITH A CORE, by W. H. Reid. Technical rept. no. 15 on Contract Nonr-562(07). Aug 58, 27p. 4 refs. 562(07)/15.
Order from LC mi$2.70, ph$4.80 PB 140 899

The effect of viscosity on the gravitational oscillations of a liquid mantle covering a rigid core is considered. Detailed results for the aperiodic modes of decay are given for $\ell = 1$, 2, 3 and 4, where ℓ is the order of the spherical harmonic deformation considered, and for $\eta = \frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$, where η is the ratio of the core radius to the mantle radius.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
ON THE FLOW OF A CONDUCTING FLUID PAST A MAGNETIZED SPHERE, by G. S. S. Ludford and J. D. Murray. Rept. on Contract AF 49(638)154. Apr 59, 22p. 2 refs. Technical note BN-169; AFOSR TN-59-424; AD-214 774.
Order from LC mi$2.70, ph$4.80 PB 140 802

In the steady flow of an incompressible, inviscid, conducting fluid past a mangetized sphere, the first-order effects of the magnetic field and conductivity are studied.

Institute of Engineering Research, U. of California, Berkeley.
THE MOTION OF A BODY IN A FLUID WITH A FREE SURFACE AND IRREGULAR SOLID BOUNDARIES, by Albert A. Hudimac. Rept. on Contract Nonr-222(30). May 58, 119p. 30 refs. Series no. 82; issue no. 5.
Order from LC mi$6.00, ph$18.30 PB 139 640

A linearized theory is developed for the velocity potential of a fluid with a free surface due to: (I) motion of a thin ship over a submerged wedge, (II) a simple harmonic pressure distribution on the surface, and (III) the motion of a thin ship in a layer of light water lying on denser deeper water. The impulsive forces and moment of force on the ship, the equivalent source distribution on the surface, and the wave resistance of the ship, respectively, are found.

Institute of Engineering Research, U. of California, Berkeley.
MOTION OF SHIPS OF SHALLOW DRAFT WITH FORWARD VELOCITY, by Richard C. MacCamy. Rept. on Contract Nonr-222(18). May 58, 37p. 8 refs. Series no. 61, issue no. 15.
Order from LC mi$3.00, ph$6.30 PB 139 638

Institute of Engineering Research, U. of California, Berkeley.
REPRODUCTION OF RECORDED OCEAN WAVES IN A SHIP MODEL TOWING TANK. PART I, by M. H. Dost. Rept. on Contract Nonr-222(18). May 58, 22p. 4 refs. Series no. 61, issue no. 16.
Order from LC mi$2.70, ph$4.80 PB 139 639

The reproduction of measured irregular seas, or any prescribed water-surface time history, in an experimental towing tank is investigated and found to be feasible. The design of an apparatus for computation of a convolution integral, utilizing the original wave record and an artificially produced kernel function, is described in some detail. Such a function, needed as the command signal for an irregular wave generator, can also be obtained by using the towing tank itself as the computing device. Mathematical proof of this theory as well as design fundamentals of a wavemaker servomechanism are given in this part of the report.

Pennsylvania State U., University Park.
SIMPLE TEST METHOD FOR DETERMINING THE DROP SIZE DISTRIBUTION OF A HOLLOW CONE SPRAY, by Hikmet Binark and W. E. Ranz. Rept. on Contract Nonr-1858(25). Aug 58, 15p. 3 refs. Proj. Squid Technical rept. PSU-2-P.
Order from LC mi$2.40, ph$3.30 PB 140 883

For hollow cone sprays, where the induced air flow crosses the drop trajectories, an apparnet drop size distribution can be obtained by considering the stopping distance of various portions of the liquid flux. A simple procedure was developed to demonstrate the relationship between drop size and liquid flux distribution.

Polytechnic Inst. of Brooklyn, N. Y.
EXPERIMENTAL INVESTIGATION OF TRANSPIRATION COOLING IN TURBULENT PIPE FLOW, by S. W. Yuan and A. Barazotti. Rept. on Contract Nonr-839(16). Aug 58, 44p. 24 refs. PIBAL rept no. 479.
Order from LC mi$3.30, ph$7.80 PB 140 764

The effect of coolant air injection at the wall on the velocity and temperature distributions of the turbulent flow in a porous-wall pipe has been experimentally investigated. The results show that the wall-friction coefficient increases with the increase of coolant injection whereas the heat transfer coefficient decreases with the increase of coolant injection. Thus, the analogue between the heat transfer and momentum transfer does not exist in transpiration cooling of pipe flow.

Wave Research Lab., U. of California, Berkeley.
LONG WAVE STUDIES, by R. L. Wiegel. Final rept. on Contract Nonr-222(42). [1957] 5p. Series no. 99, issue no. 4.
Order from LC mi$1.80, ph$1.80 PB 137 115

A study was made on: (1) The characteristics and transformation of waves of different values of $\eta_0 \lambda^2/h^3$ moving in water of uniform depth and in shoaling water in two dimensions (where η_0 is wave amplitude, λ is wave length and h is water depth). (2) The refraction of

waves of different values of $\eta_0 \lambda^2/h^3$ moving in shoaling water in three dimensions. (3) Theoretical studies of waves in the spectrum for different values of $\eta_0/\lambda^2/h^3$.

METALLURGY

Dow Chemical Co. [Midland, Mich.]
ATOMIZED MAGNESIUM POWDER. PART I: STUDIES ON THE ATOMIZING OF MAGNESIUM. PART II: CLASSIFICATION, PARTICLE SIZE MEASUREMENT AND EXPLOSIBILITY OF MAGNESIUM POWDER. Final rept. on Contract DA 20-018-ORD-6029. 14 Apr 53 43p. 13 refs. AD-40 736.
Order from LC mi$3.30, ph$7.80 PB 140 950

Methods and equipment for the wheel atomizing of Mg on a production scale have been developed. Powder can be produced with a controlled average diameter of 75 to 400 ± 50μ for the larger particles. The estimated lower limit of particle size is 40 to 50μ. The bearingless turbine has been developed into a dependable piece of production equipment with a speed limited only by the bursting strength of the rotor and wheel materials. Wheel attack by Mg can be eliminated by alloying the Mg with 1% Zn and 0.1% Zr. The air permeability method of particle size measurement was found to have an accuracy of ± 4% and to be a satisfactory fast method for certification and control of particle size during production. Explosibility of Mg powder was investigated, and all Mg dust formations should be considered hazardous.

Minerals Research Lab., U. of California, Berkeley.
DIFFRACTION OF X-RAYS BY NON-IDEAL MOSAIC CRYSTALS AND THE STRUCTURE OF PLASTICALLY DEFORMED AND ANNEALED CRYSTALS OF ZINC, by Douglas W. Bainbridge (Doctoral thesis) Jack Washburn, and Earl R. Parker. Technical rept. no. 18 on Contract N7onr-295(16). Nov 57, 161p. 33 refs. Series no. 27, issue no. 18; AD-155 306.
Order from LC mi$7.80, ph$25.80 PB 137 100

A relatively simple and workable solution was developed for the Bragg diffraction from crystals which occurs between the perfect and ideally imperfect models. The discrete mosaic block model with 2 structural parameters, the effective thickness of the crystallites and the distribution of orientations relative to reflection, is employed. Approximations are employed which permit the simultaneous evaluation of primary and secondary extinction in systems with moderate incoherent absorption. Both single and double reflection curves were calculated for zinc crystals with mosaic structures between that of perfect and ideally imperfect models. The manner in which the double reflection curve of a perfect crystal gradually shifts, with increasing imperfection, to that of the ideally imperfect crystal was demonstrated as a function of crystallite thickness and the distribution of crystallite orientations. An experimental investigation was made of the structures developed in zinc crystals as a result of plastic straining and annealing. Satisfactory agreement between theory and experiment for x-ray diffraction characteristics of single crystals of zinc was established over a very broad range of nonideal mosaic structures.

New York U. Coll. of Engineering, N. Y.
REINVESTIGATION OF THE SYSTEMS Ti-Al-Cr AND Ti-Al-V. Rept. for 1 May 56-30 Nov 57 on Metallic Materials, Contract AF 33(616)3619. Aug 58, 86p. 27 refs. WADC Technical rept. 58-105; AD-155 850.
Order from LC mi$4.80, ph$13.80 PB 140 867

In the Ti-Cr system, the $\beta/\alpha+\beta$ boundary was lower than that generally obtained by conventional quenching. In the Ti-V system, the $\beta/\alpha+\beta$ boundary was in agreement with most of the earlier determinations. Five tentative isothermal sections of the titanium-rich corner (up to 40% Al and 32% Cr) of the Ti-Al-Cr system have been constructed at 200-degree intervals between 600 and 1400°C.

Watertown Arsenal Labs., Mass.
APPLICATION OF INDUCTION HEATING TO SHORT-TIME ELEVATED TEMPERATURE TENSILE TESTING, by Albert P. Levitt and Anthony G. Martin. June 59, 18p. 2 refs. Technical rept. no. WAL TR 116/1; AD-215 626.
Order from OTS $0.50 PB 151 848

Tensile test data were obtained at 600°, 800°, and 1000°F on 120 plain and welded titanium alloy specimens. Typical results obtained are given and the limitations and possibilities of the technique discussed.

Ferrous Metals

Bureau of Ships, Washington, D. C.
STATISTICAL ANALYSIS OF YIELD STRENGTH OF HY-80 STEEL, by Alfred Lieberman. 3 July 56, 13p. Rept. no. 373C-18.
Order from LC mi$2.40, ph$3.30 PB 139 511

There was no significant difference between compression and tension with respect to yield strength. The experimental errors of the compression and tension tests were not significantly different from each other.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
PHYSICAL AND MECHANICAL PROPERTIES OF NINE COMMERCIAL PRECIPITATION-HARDENABLE STAINLESS STEELS, by D. A. Roberts, D. B. Roach, and A. M. Hall. Rept. on Contract AF 18(600)1375. 1 May 59, 83p. 1 ref. DMIC rept. 112; AD-214 194.
Order from OTS $2,25 PB 151 068

This report presents the physical and mechanical properties of commercial precipitation-hardenable stainless steels. The steels covered include the martensitic types (Stainless W and 17-4 PH), the semi-austenitic types (17-7 PH, PH15-7 Mo, AM 350, and AM 355), and the austenitic types (A-286, 17-10 P, and HNM). Room- and elevated-temperature tensile

and compressive properties, stress-rupture and creep properties, and impact, shear, bearing, and fatigue properties are reported. The effects of variations in heat treatment on these properties are also presented.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
PROPERTIES OF CERTAIN COLD-ROLLED AUSTENITIC STAINLESS SHEET STEELS, by R. J. Mangone, D. B. Roach and A. M. Hall. Rept. on Contract AF 18(600)1375. 15 May 59, 64p. DMIC rept. 113; AD-214 845.
Order from OTS $1.75 PB 151 069

Certain austenitic stainless sheet steels, when cold rolled to the full-hard and extra-hard conditions, possess properties which are suitable for aircraft structural applications. This report provides available information on the properties of five such steels in the above conditions.

[Material Lab.] New York Naval Shipyard, Brooklyn.
DEVELOPMENT OF APPARATUS AND METHODS FOR CHEMICAL AND ELECTROCHEMICAL SPOT TESTING, HIGH MANGANESE STEELS. Final rept. 26 June 58, 7p. Lab. Project 5871-6.
Order from LC mi$1.80, ph$1.80 PB 139 493

Naval Research Lab., Washington, D. C.
STUDIES OF THE EFFECT OF DYNAMIC PRELOADS ON THE MECHANICAL PROPERTIES OF STEEL, by R. C. Smith. Interim rept. 29 May 59, 15p. 7 refs. NRL rept. 5323.
Order from OTS $0.50 PB 151 685

Specimens of a low-carbon steel have been subjected to dynamic loads in an adaptation of the Taft-Pierce Shock machine for Electronic Devices. The intensity of the load was varied; some specimens were subjected to elastic shocks, involving loads in excess of the static yield stress, while in others gross yield was initiated. These specimens were then aged for a short time at temperatures ranging from 68° to 250°F and then retested dynamically or in static tension. Upper and lower yield stresses and the inelastic microstrain which preceded gross yield on the retest have been used to evaluate the extent of damage and recovery.

Ohio State U. Research Foundation, Columbus
MECHANISM OF STRESS CORROSION OF AUSTENITIC STAINLESS STEELS IN HIGH-TEMPERATURE CHLORIDE WATERS, by R. W. Staehle, F. H. Beck, and M. G. Fontana. Technical rept. no. 2 on Contract Nonr-495(11). Apr 58, 33p. 13 refs.
Order from LC mi$3.00, ph$6.30 PB 138 562

Stress-corrosion cracking of austenitic stainless steels was studied under various conditions of stress, chloride concentration, complete immersion of specimens, intermittent wetting and drying, and presence of oxygen. Stress-corrosion cracking will occur at stresses as low as 2,000 psi at 50 ppm NaCl. A three-dimensional analysis of stress-corrosion cracks was made and a mechanism of cracking proposed.

Springfield Armory, Mass.
HYDROGEN EMBRITTLEMENT RELIEF OF PHOSPHATED STEEL, by R. E. Bessey. 9 Feb 59, 12p. 1 ref. SA-TR18-1067.
Order from LC mi$2.40, ph$3.30 PB 140 744

Tests conducted to determine whether methods specified in MIL-P-16232B for relieving hydrogen embrittlement of phosphated steel are effective. Tests were made on unphosphated steel; zinc- and manganese-phosphated steel; and zinc- and manganese-phosphated steel, post-treated by low-temperature heat-treatment and by room-temperature-aging as specified. Methods specified are not effective for this steel.

Light Metals

Chance Vought Aircraft, Inc., Dallas, Tex.
EVALUATION OF NEW HIGH STRENGTH TITANIUM SHEET ALLOYS, by J. W. Seeger and S. G. Young. Quarterly progress rept. no. 4, 1 Oct-31 Dec 58 on Contract NOas-58-104c. 31 Jan 59, 111p. CVA rept. no. E9R-11834.
Order from LC mi$6.00, ph$18.30 PB 139 655

Evaluation of solution treated 4Al-3Mo-1V titanium alloy sheet. Hot creep forming after aging at temperature, results in serious strength losses. Tentative formability limits for solution treated 4Al-3Mo-1V are presented. (See also PB 138 472)

Frankford Arsenal, Philadelphia, Pa.
TENSILE PROPERTIES OF LIGHT ALLOYS AT LOW TEMPERATURES, by L. M. Smith. Dec 58, 31p. 6 refs. Memo. rept. no. MR-710.
Order from OTS $1.00 PB 151 843

Tensile strength, yield strength, per cent elongation, and per cent reduction of area of 28 wrought aluminum alloys and 6 aluminum casting alloys at temperatures of 75°, -18°, -112°, and -320°F are depicted graphically.

Rensselaer Polytechnic Inst., Troy, N. Y.
AGING EFFECTS IN TITANIUM ALLOYS, by D. J. Lam, M. F. Gendron and others. Final rept. on Contract DA 30-115-505-ORD-687. May 58, 106p. 30 refs. Rept. no. WAL 410/1.
Order from LC mi$5.70, ph$16.80 PB 139 484

Results indicate that a good combination of strength and ductility can be obtained for titanium binary alloys whose alloy content is less than eight percent, on aging for short times at 900°F. With higher alloy contents the same holds true for the Ti-V system. For a higher manganese content aging should be carried out at higher temperatures. The Ti-Cr alloys were found to be very unstable.

Nonferrous (except light) Metals

Massachusetts Inst. of Tech., Cambridge.
CHROMIUM BASE ALLOYS: I. BRITTLE TO DUCTILE TRANSITION TEMPERATURES OF BINARY C CHROMIUM ALLOYS. II. OXIDATION RESISTANCE OF BINARY CHROMIUM BASE ALLOYS. III. TRANSITION TEMPERATURES OF CHROMIUM AND CHROMIUM BASE ALLOYS, by Ernest P. Abrahamson II and Nicholas L. Grant (Doctoral thesis) Rept. on Contract NOas 56-1090-d. [1957] 51p. 21 refs.
AD-136 844.
Order from LC mi$3.60, ph$9.30 PB 137 002

I. A study has been made of the transition temperature for brittle fracture of chromium alloys with up to 30 weight percent of twenty-one different elements in binary combinations. A correlation between the rate of transition temperature change and the electron configuration of the solute element is shown and a tentative explanation of transition temperatures is put forward. II. An investigation of the oxidation resistance of binary alloys containing 70 to 100 weight percent chromium with additions of Ti, V, Mn, Fe, Co, Ni, Zr, Nb, Mo, Ru, Rh, Pd, Ta, Re, Ir, and Pt has been carried out. Test conditions were dried flowing air at 1800°F for 96 hours. In all cases a marked initial oxidation decrease with increasing alloy content is noted. Beyond this minima, variations in the oxidation curves are discussed. III. An investigation of the preparation of "ductile chromium" by the use of several scavenging elements has been carried out. The feasibility of this approach is shown by the lowering of the transition temperature from 1000 to 300°F. The initial effect of 10 alloying elements in binary combinations is shown to increase the transition temperature.

Research Chemicals, Inc. [Burbank, Calif.]
SELECTION AND EVALUATION OF RARE OR UNUSUAL METALS. PART II. THE METALLURGY OF YTTRIUM AND THE RARE EARTH METALS, by Bernard Love. Rept. for Oct 57-Oct 58 on Metallic Materials, Contract AF 33(616)5905. Mar 59, 188p. 62 refs. WADC Technical rept. 57-666, Pt. 2; AD-211 847.
Order from OTS $3.00 PB 151 825

Studies were made of yttrium and the rare earth metals, and of alloys of titanium and beryllium with rare earth additions. Improved methods for the production of pure metals are described. A complete metallographic procedure has been developed. Procedures for the chemical and spectrographic analysis of metals and alloys are provided including a method for oxygen analysis. The rate of moisture absorption of rare earth oxides was determined under controlled temperature and humidity conditions. Atmospheric corrosion of the metals in dry air was investigated to 600°C and in humid air to 95°C. The methods of preparation, analysis, and examination of titanium and beryllium alloys containing up to 10% rare earth elements are presented. Tentative partial constitutional diagrams are constructed. Very low solubility was found except for lanthanum which had an indicated solubility between 0.2 and 1.5 weight percent.

Springfield Armory, Mass.
HOT-HARDNESS INVESTIGATIONS OF COLUMBIUM AND SOME COLUMBIUM ALLOYS, by C. S. Frankowski and R. D. Korytoski. 11 Dec 58, 18p. Rept. SA-TR19-1211.
Order from LC mi$2.40, ph$3.30 PB 139 574

Hardness investigations were conducted at temperatures up to 1500°F. on commercially pure columbium columbium - 40 per cent tantalum alloy, and columbium - 8 per cent zirconium alloy. For comparison purposes, additional hot-hardness data were obtained on commercially pure tantalum, tungsten, molybdenum, molybdenum - 0.15 per cent cobalt alloy, Stelliet 21, and a 4150 modified steel.

Stanford Research Inst., Menlo Park, Calif.
MECHANICAL PROPERTIES AND OXIDATION RESISTANCE OF CERTAIN REFRACTORY METALS, by T. E. Tietz, B. A. Wilcox and J. W. Wilson. Final rept. for 1 Feb-1 Dec 58 on Contract Noas-58-366-d. 30 Jan 59, 239p. 88 refs.
Order from OTS $3.50 PB 151 855

A handbook of various mechanical thermal and oxidation properties of the refractory metals: chromium, columbium, osmium, rhenium, tantalum, tungsten, vanadium and their alloys.

Structural Metallurgy and Corrosion

[Aeronautical Materials Lab.] Naval Air Material Center, Philadelphia, Pa.
AIRCRAFT SHIELD TITANIUM, MODEL F2H-3, PART NO. 23-11186-901, EXAMINATION OF; REPORT NO. NAMC-AML-AE 4169, EXAMINATION OF TITANIUM SHIELD, PART NO. 23-11186-901 FROM F2H-3 AIRCRAFT, by E. J. Wheelahan. 18 Jan 57, 5p.
Order from LC mi$1.80, ph$1.80 PB 137 048

The titanium shield, in service, is located between the trailing edge of the wing and the terminal end of the tail pipe of the engine. The cause of failure of the subject part is attributed to the stresses created by the difference in thermal expansion of the structural components with respect to that of titanium. Approximate operating temperature was determined to be between 800°F and 1000°F.

Bureau of Ships, Washington, D. C.
STATISTICAL ANALYSIS OF CORROSION RATES OF VARIOUS MATERIALS AFTER 30 DAYS IN BIPHENYL, by A. Lieberman and B. S. Orleans. 16 Oct 56, 14p. Rept. no. 373C-8R2.
Order from LC mi$2.40, ph$3.30 PB 139 517

The object was to determine the corrosion rates at 700°F for various materials in biphenyl as a function of velocity and time.

Institute for Cooperative Research, Johns Hopkins U., Baltimore, Md.
DEFORMATION OF ALUMINUM BICRYSTALS, by L. L. France and N. K. Chen. Technical rept. no. 3 (Final) for 1 Jan 54-30 June 55 on Grain Boundary Effects in Plastic Deformation and Polygonization in Metals, Contract DA 36-034-ORD-1519. 30 June 55, 20p. 10 refs. AD-65 789.
Order from LC mi$2.40, ph$3.30 PB 140 953

The mechanical effect of a grain boundary has been studied in a series of sixteen bicrystals of high purity aluminum. The seed orientation of all bycrystals in this series is similarly located in the center of the unit stereographic triangle and is on the great circle joining the pole of the primary slip plane (111) and the slip direction [101]. The orientation difference was achieved by a rotation of one seed crystal about the specimen axis while keeping the adjacent crystal stationary. It was found that the yield stress increases sharply with the first small orientation differences (up to $\theta \approx 22^{o}$), but slowly with further increase of orientation difference. The slope of the stress-strain curves in the region corresponding to 'easy-glide' of a single crystal was found to increase almost linearly with the boundary orientation difference. A maximum of fourfold increase in the slope was obtained for the maximum orientation difference. Some observations on large deformation and failure of bicrystals have also been made.

Istituto Elettrotechnico Nazionale "Galileo Ferraris" (Italy).
ELECTRON MICROSCOPY STUDY OF SURFACE STRUCTURES IN HIGH PURITY (99.996) Al AND IN Al/4% Cu ALLOY. PART I, by Guide Bonfiglioli, Andrea Ferro, and Adriana Mojoni. Technical note no. 1 on Contract AF 61(614)1333. [1957] 17p. 20 refs. AFOSR TN-58-47; AF-148 087.
Order from LC mi$2.40, ph$3.30 PB 137 295

The present work is concerned with the surface structures (SSt) observed on Electron Microscope replicas of electropolished Al and Al/4% Cu. The results reported in the literature on the subject are reviewed and discussed together with some results by the writers. At the present state of knowledge, it is not possible to establish that the SSt represent the true subgrain structure of the metal, since it is certain that their aspect is at least partially controlled by the electropolishing conditions. However it seems very probable that the SSt bear some relation with the crystal perfection, and possibly with a non-random distribution of impurity (Cu) atoms. Some further experiments are proposed, to clarify at which extent, keeping the polishing conditions constant, the true subgrain structure of the metal is related to the SSt pattern.

James Forrestal Research Center, Princeton, N. J.
DETERMINATION OF DIFFUSION COEFFICIENTS IN SOLIDS BY THE RESIDUAL ACTIVITY METHOD, by Ralph H. Condit. Rept. on Contract AF 18(600)967. Feb 59, 19p. 5 refs. Metallurgy rept. no. 19, AFOSR TN-59-150; AD-210 984.
Order from LC mi$2.40, ph$3.30 PB 140 812

The determination of diffusion coefficients in solids with radioactive tracers is discussed with special reference to the frequently used, residual activity method. In this method the profile of tracer concentration after diffusion into the solid from a flat, plated surface is determined from measurements of the activity remaining in the solid following removal of successive layers from the surface. The proper procedure for relating the count of activity after each cut to the actual concentration of tracer is presented, necessary correction factors which have been computed are given graphically, and their use is illustrated by application to an actual experimental case.

Materials Lab., Rutgers U. New Brunswick, N. J.
SUBSTRUCTURE CHARACTERISTICS OF FINE-GRAINED METALS AND ALLOYS DISCLOSED BY X-RAY MICROSCOPY AND DIFFRACTION ANALYSIS, by Sigmund Weissmann. Technical rept. no. 9 on Contract Nonr-404(09). 15 Aug 58, 34p. 10 refs.
Order from LC mi$3.00, ph$6.30 PB 140 756

The topographical relationship of the grains of a fine-grained material and the fine-structural details of their surface texture are disclosed by a special technique of reflection x-ray microscopy. Quantitative information is obtained concerning the lattice misalignment of the grains, the size of subgrains, disorientation angle between subgrains, lattice misalignment existing within the subgrains and the nature of low-angle boundaries.

Naval Ordnance Lab., White Oak, Md.
THE CORROSIVITIES OF PLASTICS AND RUBBERS, by H. A. Perry, Jr., A. M. Chreitzberg and others. 8 Jan 58, 42p. 8 refs. NAVORD rept. 6036; AD-160 286.
Order from OTS $1.25 PB 151 750

Some plastics and rubbers in contact with certain metals in humid environments have been found to contribute to the corrosion of the metals under practical conditions. A few plastics have been found to cause corrosion at a distance within closed systems. Four types of tests have been employed for the determination of the relative corrosivities of plastics, rubbers and compounding ingredients. Data are presented on the relative corrosivities of various classes of plastics and rubbers.

Polytechnic Inst. of Brooklyn, N. Y.
EXPERIMENTAL INVESTIGATION OF CLAMPED CIRCULAR PLATES SUBJECTED TO RAPID CREEP, by Burton Erickson, Sharad A. Patel and N. J. Hoff. Rept. on Contract AF 18(600)1381. July 57, 12p. PIBAL rept. no. 411; AFOSR TN-58-51; AD-148 093.
Order from LC mi$2.40, ph$3.30 PB 139 478

Twenty-one clamped circular plates 12 in. in diameter made of 5052-0 aluminum alloy sheet were maintained at 500°F and were subjected to a constant uniform lateral pressure. The lateral deflection of the center of the plate was measured in each test. Curves showing the change in deflection with time are presented in the report.

Polytechnic Inst. of Brooklyn, N. Y.
INVESTIGATIONS CONDUCTED AT THE POLY-

TECHNIC INSTITUTE OF BROOKLYN ON STRESSES IN STRUCTURAL ELEMENTS IN THE PRESENCE OF CREEP. Final summary technical rept. for 1 Feb 55-30 June 57 on Contract AF 18(600)1381. Jan 58, 11p. 7 refs. PIBAL rept. no. 418; AFOSR-TR-58-12; AD-148 092.
Order from LC mi$2.40, ph$3.30 PB 139 479

Part I: Theoretical phase: Indications were that elastic and plastic analogs exist for both transient and steady creep conditions. Creep problems in column, beam, tube, truss, frame, and plate structures were solved. Experimental phase: Two types of creep experiments were performed. One involved rectangular frames subject to the 2 opposing loads in the plane of the frame. The experimental deflection rates obtained were in good agreement with theoretical predictions. The second type of test involved damped circular plates subject to uniform lateral pressure and to rapid creep. Part II: Abstracts of all technical reports published under the subject contract are presented with concise remarks relative to the significance of the results, and a comparison with the results of other applicable investigations.

Virginia Inst. for Scientific Research, Richmond
THE EFFECT OF FOREIGN METALS ON THE CORROSION OF TITANIUM IN BOILING 2M HYDROCHLORIC ACID, by W. Roger Buck, III, Billy Sloope, and Henry Leidheiser, Jr. Rept. on Contract AF 18(600)1319. 22 Dec 58, 54p. 6 refs. AFOSR [TR]-59-5, Pt. 1; AD-208 758.
Order from LC mi$3.60, ph$9.30 PB 139 592

The rate of corrosion of titanium was determined in boiling 2M HCl when contacted to aluminum, cadmium, tin, zirconium, lead, bismuth, mercury, silver, copper, antimony, vanadium, 70:30, 50:50, and 30:70 copper-nickel alloys, iron, palladium, cobalt, nickel, gold, rhodium, platinum, and iridium. Less extensive corrosion measurements of the same type were also made in 0.6 and 2M H_2SO_4. The potentials of the couple and of the two members of the couple were determined in boiling 2M HCl for 20 of the systems studied. A maximum occurred in corrosion rate at a couple potential of -0.49 volt vs. the saturated calomel electrode.

Watertown Arsenal Labs., Mass.
A TECHNIQUE FOR THE MICROSTRUCTURAL EXAMINATION OF POLYCRYSTALLINE GRAPHITES, by A. Tarpinian and G. E. Gazza. Feb 59, 29p. 9 refs. WAL TR 132.5/1; AD-210 086.
Order from LC mi$2.70, ph$4.80 PB 139 669

In order to prevent smearing a technique for impregnating the porous structure with a resin that hardens at room temperature was used to reinforce the graphite specimens. This operation showed significant improvement in polishing efficiency and preservation of microstructure. Finer detail was brought out by etching with a solution of potassium dichromate in concentrated phosphoric acid. Photomicrographs, using the techniques described, are presented and discussed.

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

Noyes Chemical Lab., U. of Illinois, Urbana.
CHEMICAL APPLICATIONS OF NUCLEAR RESONANCE, by H. S. Gutowsky. Technical rept. no. 5 on Contract Nonr-1834(13). 5 Nov 57, 26p. 44 refs.
Order from LC mi$2.70, ph$4.80 PB 137 136

Two broad areas of study are involved. The first is the investigation of molecular motions in solids by the combination of line shape and spin-lattice relaxation time measurements, as a function of temperature. The second is high resolution NMR spectroscopy which must account for 80 to 90% of the NMR research being done by chemists today.

Elementary Particles

Ecole Normale Supérieure, Paris (France).
K^+ - DEUTERIUM SCATTERING, I, by M. Gourdin and A. MARTIN. Technical note no. 12 on Contract AF 61(052)173. [1958] 15p. 5 refs. AFOSR TN-59-48; AD-209 419.
Order from LC mi$2.40, ph$3.30 PB 139 557

Naval Propellant Plant, Indian Head, Md.
METHODS FOR PREPARING SMALL PARTICLES OF METALS AND SALTS, by Abraham Rotkowitz. 3 Dec 58 [19]p. 31 refs. Memo. rept. no. 156.
Order from OTS $0.50 PB 151 642

Current techniques for production of submicron particles are reviewed in the light of their applicability to certain salts and metals. For salts, two methods, precipitation and spray drying, are the most feasible. For metals, a method involving vaporization and condensation seems best.

Northrop Aircraft, Inc., Hawthorne, Calif.
PROPOSED MODIFICATION IN NEPA MONTE CARLO CALCULATIONS, by Richard Talmadge and Bernard A. Shoor. Rept. on Analytical Design Studies of Shielding Configurations for Gamma and Neutron Radiation. 20 July 49, 7p. NEPA 1087-NOR-83; Rept. no. NSR-214; ATI-201 533.
Order from LC mi$1.80, ph$1.80 PB 137 031

Pittsburgh U., Pa.
CAPTURE-LOSS AND IONIZATION CROSS-SECTIONS OF IONS AND NEUTRAL PARTICLES, by W. H. Kasner and T. M. Donahue. Technical rept. no. 3 on Contract Nonr-624(06). Nov 57, 93p. 55 refs.
Order from LC mi$5.40, ph$15.30 PB 137 141

Measurements of the cross sections for electron capture and loss by protons and hydrogen atoms in H_2 in the energy range from 2.4 to 33 Kev by a combination of new methods are presented. A discussion of the reasons for the disagreement with previous results is included

Purdue U., Lafayette, Ind.
UNIVERSAL WEAK BOSON AND FERMION INTERACTION, by Masao Sugawara. Rept. on Contract AF 18(600)1579. [1958] 19p. 15 refs. AFOSR TN-58-858; AD-203 664.
Order from LC mi$2.40, ph$3.30 PB 137 108

A modified interpretation of an idea of divergenceless currents due to Feynman and Gell-Mann is investigated in detail in which some pairs of Bosons (pions and K-mesons) are assumed to exist, besides Fermion pairs, among members exerting a universal weak interaction.

Stanford U., Calif.
HIGH-ENERGY BREMSSTRAHLUNG IN ELECTRON-PROTON COLLISIONS, by R. A. Berg and C. N. Linder. Technical rept. no. 38 on Contract AF 18(600)545. Sep 58, 21p. 9 refs. Stanford rept. no. 545-38; AFOSR TN-58-830; AD-202 915.
Order from LC mi$2.70, ph$4.80 PB 137 112

The cross section for the bremsstrahlung resulting from high-energy collisions of electrons with protons is calculated, considering the electrons as extreme relativistic and taking into consideration the proton's recoil, anomalous magnetic moment, bremsstrahlung and form factors. The final cross section is integrated over the recoil proton and final photon to obtain a formula of interest for the Stanford accelerator experiments.

Yale U., New Haven, Conn.
EFFECTS OF ATOMIC ELECTRONS ON p-p AND n-p SCATTERING II, by G. Breit. Rept. on Contract AF 18(600)771. 3 Apr 59, 4p. 3 refs. AFOSR TN-59-369; AD-213 861.
Order from LC mi$1.80, ph$1.80 PB 140 804

Instruments and Installations

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
GAMMA-RAY SPECTRAL DETERMINATION IN THE TEST FACILITIES OF THE AIR FORCE NUCLEAR ENGINEERING TEST REACTOR, by Joseph Pidkowicz. Master's thesis. Mar 59, 67p. 34 refs. GNE-59-13.
Order from LC mi$3.90, ph$10.80 PB 140 930

The lack of adequate gamma-ray measurements for radiation effects studies on materials has seriously hindered correlation of results and understanding the processes involved. A survey of the instruments previously used for reactor gamma-ray measurements have uncovered three methods; a magnetic spectrometer, a single and multiple crystal scintillation spectrometer. Each of these are evaluated against the criteria set forth for the spectral determinations in the Air Force Nuclear Engineering Test Facilities. The multiple-crystal spectrometer has been selected to obtain the spectrum.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
LINEAR ELECTRON ACCELERATOR DESIGN, by James T. Westermeier. Master's thesis. Mar 59, 61p. 19 refs. GNE-59-19.
Order from LC mi$3.90, ph$10.80 PB 140 734

This thesis gives a brief historical review of the linear electron accelerator. The feasibility of designing a low energy accelerator to attain a variable energy output by varying the frequency of oscillation is investigated. The theory of the disk loaded waveguide and the dynamics of electrons in an axial electric field are discussed. A numerical design of a 500 Kev accelerator is accomplished, and it is shown that the output energy can be varied between approximately 400 to 560 Kev by varying the frequency, electric field intensity and injection energy. Procedures for an exact calculation are outlined.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
SILANE GLASS AS A BETA AND GAMMA SCINTILLATOR, by Robert Frank Cooper. Master's thesis. Mar 59, 52p. 31 refs. GNE-59-6.
Order from LC mi$3.60, ph$9.30 PB 140 941

Some of the properties of triphenyl-p-biphenylylsilane have been determined. This scintillator material is a low melting (158°C), transparent, glassy solid. In comparing the scintillation characteristics of this scintillator with anthracene the following results were obtained: (1) its gamma detecting ability is slightly better than anthracene; (2) its relative scintillation efficiency is approximately 60% that of anthracene; and (3) its light conversion efficiency is nearly equal to that of anthracene. Other results obtained show this silane has excellent beta detection ability and the pulse height is decreased about 12% for each centimeter thickness of silane phosphor.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE USE OF BORON LOADED SILANE GLASS SCINTILLATORS FOR THERMAL NEUTRON DETECTION, by Emory Neudeck Kemler. Master's thesis. Feb 59, 47p. 35 refs. GNE-59-10.
Order from LC mi$3.30, ph$7.80 PB 140 925

Triphenyl-p-biphenylyl silane glass scintillators were loaded with four boron materials in an attempt to produce a thermal neutron detector. The silane glass was made opaque by homogenous addition of natural boron, boric acid, or borax. Scintillators loaded with triphenly-borazole were transparent and produced a pulse peak for alpha particles from the B^{10}- thermal neutron reaction. Because of the scintillators nonlinearity of response with energy; the gamma radiation from the Po-Be neutron source could not be discriminated against. After short periods of exposure to thermal neutrons internal distintegration of the triphenyl-borazole loaded scintillators was noted.

Battelle Memorial Inst., Columbus, Ohio.
NEUTRON DOSIMETRY RESEARCH, by W. S. Diethorn, D. J. Hamman and others. Quarterly progress rept. no. 1, 15 Mar-14 June 57, on

[Contract DA 36-039-sc-73174.] 30 June 57, 18p. 15 refs. AD-142 557.
Order from LC mi$2.40, ph$3.30 PB 137 193

A survey of dosimeter systems of potential interest to the Signal Corps for personnel neutron dosimetry in mixed neutron and gamma radiation fields has been initiated. The results of this survey will be the basis for the selection of semiconductor, tissue-equivalent ionization chamber, and chemical recoil-proton systems which show promise for neutron dosimetry in the 0-600 rad dose range. An experimental program has been designed to evaluate several semiconductor systems. A tissue-equivalent ionization chamber is now being designed, and this instrument will be constructed in the next quarter. No experimental program on chemical recoil-proton systems has been

Battelle Memorial Inst., Columbus, Ohio.
NEUTRON DOSIMETRY RESEARCH, by W. S. Diethorn, E. Paskell and others. Quarterly progress rept. no. 2, 15 June-14 Sep 57, on Contract DA 36-039-sc-73174. 2 Oct 57, 27p. 14 refs. AD-148 273.
Order from LC mi$2.70, ph$4.80 PB 137 194

The examination of important semiconductor literature was continued and the theoretical analysis of lifetime phenomena in silicon and germanium extended. Experimental work was initiated to determine the relationship between neutron dose and lifetime changes in these materials. Preliminary experiments were completed on single crystals of AlSb, CdTe, and InP, as part of the study to determine the application of these high-energy-gap compound semiconductors to neutron dosimetry based on conductivity changes. (See also PB 137 193)

Bureau of Ships, Washington, D. C.
STATISTICAL ANALYSIS OF DENSITY READINGS OF DUPONT 502FILM BADGES AFTER EXPOSURE TO X-RAYS OF 0.07-MEV AVERAGE ENERGY, by A. Lieberman and B. S. Orleans. 15 Jan 57, 11p. 4 refs. Rept. no. 373-1(36).
Order from LC mi$2.40, ph$3.30 PB 139 513

The object was to estimate the maximum radiation exposure any person may have had based on the density readings found from the film badge he had worn.

Colorado U., Boulder.
RESEARCH AND DEVELOPMENT IN CONNECTION WITH HIGH ALTITUDE CLOUD CHAMBER STUDY OF COSMIC RAY NUCLEAR INTERACTIONS, by Albert B. Weaver. Final rept. for 1 Jan 56-31 Dec 58 on Contract DA 23-072-ORD-956. [1958] 19p.
Order from LC mi$2.40, ph$3.30 PB 139 525

An apparatus was designed, and is almost completed, for the purpose of studying high-energy cosmic ray nuclear interactions. It consists of three cloud chambers mounted one above the other, and the associated counters and circuits.

Materials Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
REMOVAL DOSE AS AN ENVIRONMENTAL MEASUREMENT OF X-RAYS AND GAMMA RAYS, by R. L. Hickmott. Rept. for May-Dec 58 on Nuclear Instrumentation. Apr 59, 37p. 6 refs. WADC Technical rept. 59-119; AD-211 918.
Order from OTS $1.00 PB 151 838

The Removal Dose of any material is the net energy per unit mass that a limitingly small mass of the material transfers from the incident photon flux to the kinetic energy of the associated flux of charged particles. Removal Dose is compared to both Absorbed Dose and Exposure Dose (roentgen) in terms of cross sections and spectra. Its relation to radiation effects is compared to the similar relation of Absorbed Dose.

Naval Radiological Defense Lab., San Francisco, Calif.
AN ELAPSED-LIVE-TIME CLOCK FOR THE PENCO PA-3 PULSE-HEIGHT ANALYZER, by R. A. Taylor. 1 July 58, 12p. 2 refs. Research and Development Technical rept. USNRDL TR-251.
Order from LC mi$2.40, ph$3.30 PB 140 856

An instrument has been designed and constructed to operate with the Penco PA-3 100-channel Pulse-Height Analyzer which automatically measures the elapsed and live time of the analyzer. The analyzer counting time can be preset from either the elapsed- or live-time clock.

Naval Radiological Defense Lab., San Francisco, Calif.
PROCEEDINGS OF THE SHIELDING SYMPOSIUM HELD AT NRDL, SAN FRANCISCO, 17-19 OCTOBER 1956, VOL. 1. 1 Feb 57, 241p. 49 refs. USNRDL Reviews and Lectures no. 29; AD-132 830.
Order from LC mi$11.10, ph$37.80 PB 140 788

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
A SURVEY OF CURRENT RESEARCH AND DEVELOPMENTS IN THE FIELD OF DOSIMETRY, by M. J. Oestmann, J. F. Kircher and P. Schall, Jr. Rept. on Contract AF 33(616)5171. 31 May 58 [44]p. 132 refs. REIC Rept. no. 6; AD-157 172.
Order from OTS $1.25 PB 151 571

This report is the sixth of a series summarizing the state of the art on the effects of nuclear radiation on classes of materials, components, and systems of interest to designers and engineers concerned with nuclear-powered weapons systems. It surveys the current practices used in high-level dosimetry of gamma, neutron, and mixed fields. It is intended to augment radiation damage information presented in other reports of this series.

Uppsala U. (Sweden).
INSTITUTE OF PHYSICS TECHNICAL REPORT. Rept. for 1 Sep 56-31 Aug 57 on Contract AF 61(514)1015, phase B. [1957] 16p. 3 refs. AFOSR TR-58-26; AD-152 201.
Order from LC mi$2.40, ph$3.30 PB 140 918

Contents:
An atomic beam resonance apparatus with focusing six-pole magnets. Measurements on some bismuth isotopes, by I. Lindgren and M. Johansson
The decay of the isotopes $Au^{191-196}$, by G. Bäckström, O. Bergman, J. Burde and J. Lindskog
Gamma transitions in As^{76}, Se^{76}, by G. Bäckström

Air Force Inst. of Tech. [Wright-Patterson AFB, Ohio].
AIR FORCE INSTITUTE OF TECHNOLOGY SUB-CRITICAL ASSEMBLY, by James Douglas Butt. Master's thesis. Mar 58. 59p. 9 refs. GNE [58]-6.
Order from LC mi$3.60, ph$9.30 PB 137 006

The objective of this thesis is to present in a factual manner the details of the AFIT subcritical assembly. The information herein is primarily intended as a reference for those who will be using this laboratory facility and for those who may desire to design a subcritical assembly for other schools.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
POST-NEUTRON MEASUREMENTS AND CALIBRATION PROCEDURES FOR THE AIR FORCE NUCLEAR ENGINEERING TEST REACTOR, by Albert Nelson Tardiff. Master's thesis. Mar 59, 117p. 35 refs. GNE-59-18.
Order from LC mi$6.00, ph$18.30 PB 140 927

A discussion of the distributed poison method for calibrating control rods and a method of determining the thermal neutron absorption cross section of the core by use of the inhour equation and the distributed poison method is presented. Methods of determining the reactivity worth of the core test facilities and components are described. The reactivity worth of changing the configuration of the core region is measured by the poison method or by control rod movements. Other measurements include the shutdown capability of control rods, the fuel weighting factors, and void coefficients and the thermal and fast flux measurements.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
RADIATION EFFECTS TESTING MANUAL, by Ambrose Edward Smith. Master's thesis. Mar 59, 169p. 46 refs. GNE-59-15.
Order from LC mi$7.80, ph$25.80 PB 140 964

This manual was prepared as an initial guide to project engineers with little or no nuclear engineering background, but who find it necessary to plan and design nuclear irradiation experiments for conduct in the Air Force Nuclear Engineering Test Facility (AF (NETF). An elementary treatment of atomic and nuclear physics, nuclear radiation, and nuclear radiation shielding and dosimetry are included as well as a summary of radiation effects on materials (with appended tables); the facilities, organization and operational concepts of the AF NETF; and notes on experiment planning. Tables and graphs of nuclear data are also included to aid in performing initial computations.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A THEORETICAL AND EMPIRICAL COMPARISON OF LIGHT AND HEAVY WATER REACTORS FOR A USAF RADIATION EFFECTS FACILITY, by Lawrence Albert Skantze. Master's thesis. Mar 59, 60p. 23 refs. GNE-59-14.
Order from LC mi$3.60, ph$9.30 PB 140 923

The purpose of this thesis is to determine whether a light or heavy water reactor is more suitable for a radiation effects facility. The determination is based on fast flux leakage per unit power, safety of the reactor, and capital and operational costs. A parameter study comprises the body of the thesis. Light and heavy water bare reactors, of varying parameters, are evaluated with a digital computer program. The light water reactor, operating at moderate power, is superior in fast flux leakage per unit power and in cost. Prompt neutron generation time is not a realistic safety parameter of this study.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A TREATISE ON THE PRELIMINARY HAZARD SUMMARY REPORT FOR NUCLEAR FACILITIES, by Gerald Bernard Connor. Master's thesis. Mar 59, 138p. 72 refs. GNE-59-5.
Order from LC mi$6.90, ph$21.30 PB 140 928

Each section of the suggested format is described in detail; telling an applicant what he must include in his report, why it should be included, and in what form it should be included. The suggested eight sections of a Preliminary Hazards Summary Report are: (1) Summary; (2) Introduction; (3) Site Analysis; (4) Facility Description; (5) Accident Analysis; (6) Operating Procedures; (7) Hazards Analysis; and (8) Evaluation of the Facility's Hazards.

Plasmadyne Corp., Santa Ana, Calif.
ELEMENTARY CONSIDERATIONS OF THE DIRECT CONVERSION OF THERMONUCLEAR ENERGY TO ELECTRICAL ENERGY, by Adriano C. Ducati. Rept. on Contract AF 49(638)332. 1 Sep 58, 16p. 3 refs. Technical note no. E-3TN098-332; AFOSR TN-58-792; AD-202 225.
Order from LC mi$2.40, ph$3.30 PB 137 155

The present elementary analysis is in two sections. The first considers the maximum energy that can be expected from certain fuels. The second considers the problem of extracting the energy from the fuel.

Walter Kidde Nuclear Labs., Inc., Garden City, N. Y.
CONCEPTUAL DESIGN OF EXPERIMENT PLUG AND COFFIN ASSEMBLY, by Aaron Baumgarten. Rept. on Subcontract to Contract NOas-56-891C. 14 Jan 57, 37p. 1 ref. WKNL-83.
Order from LC mi$3.00, ph$6.30 PB 139 485

A conceptual design and operating procedure are described for utilizing the HG-9 hole in the MTR reactor for fast-neutron irradiation of aircraft materials and components under dynamic conditions.

Radioactivity

Naval Radiological Defense Lab., San Francisco, Calif.
RELATIVE DECONTAMINATION OF CLEAN AND ARTIFICIALLY SOILED NAVY GRAY PAINT SURFACES, by J. L. Mackin. 22 Jan 57, 18p. 5 refs. Research and Development technical rept. USNRDL-TR-130; AD-126 750.
Order from LC mi$2.40, ph$3.30 PB 140 905

Decontamination experiments have been carried out with both clean and artificially soiled Navy gray paint surfaces. In most cases it was more difficult to decontaminate soiled surfaces than similar clean surfaces, and wetting characteristics indicated a higher susceptibility to contamination for the soiled samples.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
EFFECTS OF IRRADIATION ON QUARTZ AND QUARTZ CRYSTAL UNITS. RECORDED EXPERIMENTS: A BIBLIOGRAPHY, by R. Bechmann. 26 May 58, 59p. 62 refs. Technical memo. M-1892.
Order from OTS $1.50 PB 151 697

This report is a literature survey covering the effects of irradiation due to X-ray, Gamma-ray, and neutrons on quartz and piezoelectric quartz crystal units. Some of these effects, e.g., the change of frequency due to irradiation, are of significance for frequency control application.

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
FACTORS INFLUENCING THE EVALUATION OF EAR PROTECTIVE DEVICES, by R. G. Hansen and D. T. Blackstock. Rept. on Generation, Propagation, Action and Control of Acoustic Energy. May 58, 36p. 9 refs. WADC Technical rept. 57-772; AD-142 266.
Order from LC mi$3.00, ph$6.30 PB 140 909

The primary purpose of this study was to determine the number of subjects and the number of repeat measurements necessary to obtain a reliable value for the average attenuation of an ear plug under specific controlled conditions. Results indicate that satisfactory data would be obtained with ten subjects making three repeat measurements. Approximately the same results would be obtained with six subjects making five replications or 15 subjects making one replication.

Essex Mills, Inc.
DEVELOPMENT OF CORELESS TYPE BRAIDS FOR USE IN PERSONNEL-PARACHUTE SUSPENSION LINES, by Melvin B. Landis and Freeman W. Fraim, III. Rept. for 1 Mar 57-15 May 58 on Air Force Textile Materials, Contract AF 33(616)3993. Dec 58, 55p. WADC Technical rept. 58-410; AD-206 891.
Order from OTS $1.50 PB 151 704

The braids developed were to equal or exceed the specification minimums of strength, weight in yards per pound, and elongation of Type II and Type III cords as made under Specification MIL-C-5040A. The coreless braids developed were to have equal or better seam efficiency, abrasion resistance, snag resistance and energy absorption than the core and sleeve type cords. The coreless cords were to be made using both Nylon 6 and Nylon 6, 6. To evaluate snag resistance a procedure was developed using the abrasion machine described in MIL-W-4088C. This investigation showed that coreless type cords can be produced to replace the presently used core and sleeve type cords.

Quartermaster Research and Engineering Center, Natick, Mass.
INFLUENCE OF COLORANT SYSTEMS ON THERMAL PROTECTION, PARTS III, IV, AND V, by Alvin O. Ramsley. Feb 59, 58p. 4 refs. Textile Series rept. no. 105.
Order from LC mi$3.60, ph$9.30 PB 140 749

The three papers reported describe laboratory studies which considered the influence of colorant systems on various methods of heat flow through fabric assemblies exposed to intense radiant energy of short duration. Observations and conclusions are essentially empirical rather than theoretical.

PHYSICS

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
PROGRESS REPORT NO. XXI, by A. von Hippel. Rept. on Contracts Nonr-1841(10), AF 30(635)2872, and AT (30-1)1937. June 57, 66p. 43 refs.
Order from LC mi$3.90, ph$10.80 PB 137 056

Progress is reported on dielectric spectroscopy, excitation, conduction and breakdown, spontaneously organized dipole systems (ferroelectrics and ferromagnetics), single crystals and ceramics.

Acoustics

American Museum of Natural History, New York.
ANALYSIS OF UNDERWATER SOUNDS PRODUCED BY MARINE FISHES, by William N. Tavolga. Annual progress rept. for 1 Sep 57-31 Aug 58 on Contract Nonr-552(06). 1 Feb 58, 4p. 3 refs.
Order from LC mi$1.80, ph$1.80 PB 140 901

The following reports have been published: The significance of underwater sounds produced by males of the Gobiid fish, Bathygobius soporator. Physiological Zoology, 3 (4): 259-271, 1958. Underwater sounds produced by males of the Blenniid fish,

Chasmodes bosquianus. Ecology, 39 (4): 759-760, 1958. Underwater sounds produced by two species of Toadfish, Opsanus tau and Opsanus beta. Bulletin of Marine Science of the Gulf and Caribbean, 8 (3): 278-284, 1958.

Bureau of Ships, Washington, D. C.
STATISTICAL PLAN FOR BATHYSCAPHE PROGRAM, by A. Lieberman. 11 June 57, 16p. 2 refs. Rept. no. 310B-4(72).
Order from LC mi$2.40, ph$3.30 PB 139 518

The object of this plan was to investigate characteristics of background noise as a function of depth and to compare the sound levels of four modes of directivity, four frequency bands and four sectors (bearings).

Bureau of Ships, Washington, D. C.
STATISTICAL PLAN FOR HYDROPHONE CALIBRATION TEST, by A. Lieberman and P. Brown. 19 Feb 57, 5p. Rept. no. 310B-1(45).
Order from LC mi$1.80, ph$1.80 PB 139 512

The object was to determine the between and within hydrophone phase angle variance to select a group of hydrophones at the center of the distribution, and to determine the effect of bearing on phase angle.

Hopkins Marine Station, Stanford U., Pacific Grove, Calif.
ECOLOGY OF SONIC SCATTERING LAYERS IN THE MONTEREY BAY AREA, by Eric George Barham. Technical rept. no. 1 on Contract N6onr-251(27), NSFG-911 and NSFG-1780. 11 Feb 57, 191p. 65 refs.
Order from LC mi$8.70, ph$30.30 PB 139 476

Electricity and Magnetism

Acoustics Research Lab., Harvard U., Cambridge.
COUPLING COEFFICIENTS, by John F. Hersh. Technical memo. no. 40 on Contract Nonr-1866(24). 15 Nov 57, 123p. 62 refs.
Order from LC mi$6.30, ph$19.80 PB 137 655

A review of the literature on coupling reveals that coupling coefficients have not been given a general definition nor has their physical significance been well explained, particularly for systems with antireciprocal or gyroscopic coupling. A new definition of coupling coefficients is proposed in which the coupled systems are viewed as having a forward transmission path and a feedback path and the coefficients are defined as the values of the feedback return ratio with reference to the coupling element which are positive maximum with variations in load and frequency. This definition in terms of feedback makes possible the use of feedback theory to relate the coefficients to input impedance, critical frequencies, and the conditions for stability and physical relizability; this is illustrated by its application to several electrical and electromechanical systems, including examples of antireciprocal coupling.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
GAMMA RADIATION EFFECT ON THE ELECTRICAL CONDUCTIVITY OF MATERIALS, by Walter Frederick Pfeiffer. Master's thesis. Mar 59, 68p. 25 refs. GNE-59-12.
Order from LC mi$3.90, ph$10.80 PB 140 924

A conductivity cell was designed and built to study electrical conductivity of materials in a high intensity gamma ray field. Results from measurements of the volume conductivity of a polyethylene disc were not significant because of problems which stemmed from polarization currents and non-ohmic relations for small voltages. The volume conductivity of a single crystal of sodium chloride varies lineraly with gamma field intensity from 8×10^{-16} (ohm-cm)$^{-1}$ at 3.5×10^{3} R/hr to 4×10^{-14} at 2×10^{-5} R/hr at 23°C. Comparison of results with theory developed by Rose indicates that the steady state Fermi level is among or above a uniform distribution of trapping energy levels in the energy gap.

Hebrew U. (Israel).
PARAMAGNETIC RESONANCE SPECTRUM OF GADOLINIUM IN HYDRATED LANTHANUM TRICHLORIDE, by M. Weger and W. Low. Technical note no. 2 on Contract AF 61(052)59. May 58, 16p. 5 refs. AFOSR TN-58-543; AD-158 360.
Order from LC mi$2.40, ph$3.30 PB 136 996

The paramagnetic resonance spectrum of Gd^{3+} in $LaCl_3 \cdot 7H_2O$ was measured and found to agree quite well with a spin Hamiltonian with dominant coefficients $b_2^0 = \pm 0.013\ 1\ cm^{-1}$, $b_2^2 = \mp 0.0075\ cm^{-1}$ at room temperature, and $b_2^0 = \pm 0.0099\ cm^{-1}$, $b_2^2 = \mp 0.0115\ cm^{-1}$ at liquid air temperature.

Institute of Mathematical Sciences, New York U., N. Y.
RESEARCH IN MATHEMATICAL METHODS OF ELECTROMAGNETIC THEORY. Final rept. for 7 Feb 57-31 Aug 58, on Theory of Electromagnetic Research, Contract DA 49-170-sc-2253. 1 Sep 58, 12p. 9 refs.
Order from LC mi$2.40, ph$3.30 PB 137 095

The objective of the research performed under this contract was to extend the mathematical knowledge and methodology which would be useful in the solution of electromagnetic problems and to undertake the solution of electromagnetic problems wherein the difficulties are mathematical.

[Laboratory of Magnetics Research] Carnegie Inst. of Tech., Pittsburgh, Pa.
RESEARCH IN FERROMAGNETISM, by A. Arrott and J. E. Goldman. Final rept. for 1 June 50-31 Oct 57 on Contract N7onr-303(07). [1957] 22p. 27 refs.
Order from LC mi$2.70, ph$4.80 PB 137 059

Summarizes work between 1950 and 1957: magnetostriction and magnetoresistance measurements; magnetic susceptibility and magnetic moment measurements as a technique for revealing exchange interactions in metal and alloy systems; antiferromagnetic interactions in salts, metals and alloys.

Michigan U. Research Inst., Ann Arbor.
INVESTIGATION OF MICROWAVE PROPERTIES OF FERROELECTRIC MATERIALS, by C. B. Sharpe, H. Diamond, and G. Brockus. Quarterly progress rept. no. 3, 1 Aug-1 Nov 58, on Contract DA 36-039-sc-75003. Nov 58, 19p. 2 refs. 2732-3-P.
Order from LC mi$2.40, ph$3.30 PB 140 810

An improved method of sample holder calibration is described and data taken on the complex dielectric constant of $BaTiO_3$ versus frequency, bias field, and temperature is presented. An approximate theory for measuring the complex dielectric constant of coaxial samples is outlined.

Naval Ordnance Test Station, China Lake, Calif.
ELEMENTARY PRINCIPLES OF ELECTRICITY AS APPLIED TO ACCIDENT PREVENTION, by B. W. Pike. Jan 57, 17p. 1 ref. NOTS-1868.
Order from LC mi$2.40, ph$3.30 PB 140 763

Electrons can be forced to flow through anything by a potential-difference. Conductors resist the flow very little, and insulators very greatly. Current increases with increasing potential-difference and decreases with increasing resistance. Current generates heat, and will flow "through" a perfect insulator under an alternating potential-difference. Current can also cause electric shock, although insulation will reduce the current to safe values. Shielding, properly grounded, offers protection in the event of insulation failure, and protection against capacitive currents which "flow" through perfect insulators. The human skin is a poor insulator and any potential-difference greater than 50 volts is a potential killer.

Plasmadyne Corp., Santa Ana, Calif.
THE "PUNCH" METHOD OF COMPRESSING, HEATING AND CONFINING OF A PLASMA, by Hendricus G. Loos. Rept. on Contract AF 49(638)335. 1 Dec 58, 26p. 10 refs. T-1TN128-335; AFOSR TN-58-1130; AD-207 975.
Order from LC mi$2.70, ph$4.80 PB 139 488

A method of compression, heating and confinement of a plasma by means of a suddenly applied magnetic field of external origin is explored. The basic cylindrical configuration does not show any instabilities in the hydrodynamic approximation. The number N_l of ions per unit length along the tube is shown to be related to the amount of separation between plasma and field that is achieved in times small compared with the decay time of the field and N_l determines how many large angle collisions an ion will undergo with other ions during the decay time. Order of magnitude calculations have been made of the energy required for heating by isentropic compression and of the energy and voltage required for shock heating.

Remington Rand Univac Div., Sperry Rand Corp. [Philadelphia, Pa.]
THE PREPARATION AND CHARACTERISTICS OF THIN FERROMAGNETIC FILMS. Final engineering rept. on Contract AF 19(604)2659. Nov 58, 131p. 116 refs. AFCRC TR-58-187; AD-160 845.
Order from OTS $2.75 PB 151 525

Thin nickel-iron films with a wide range of compositions and thicknesses were prepared by electrodeposition. Films of 21- to 22-percent iron content, about 5000 Ångstroms in thickness, yielded the lowest coercivity (1.2 oersteds) and the highest B_r/B_m value (0.95). Films prepared by thermal decomposition of acetyl acetonates over a wide range of compositions demonstrated rectangular hysteresis loops in all directions; some of them were isotropic. The best samples had a lower switching constant than some vacuum-deposited films.
Contents:
Methods of preparing thin films
Electrodeposition of nickel-iron films
Nickel-iron films through thermal decomposition of acetyl acetonates
Analytical chemical procedures
Syntheses of iron and nickel acetyl acetonates
Anisotropy and coercivity in thin films

Electronics

Electronics Research Lab., U. of California, Berkeley.
ENTRANCE CONDITIONS FOR ELECTRON BEAMS FOCUSED BY AXIALLY SYMMETRIC MAGNETIC FIELDS, by J. L. Palmer. Rept. on Contract AF 49(638)102. June 58, 68p. 22 refs. Series no. 60, issue no. 197; AFOSR TN-58-557; AD-158 375.
Order from LC mi$3.90, ph$10.80 PB 137 153

The differential equations of motion of an electron beam of high space charge moving through an axially symmetric magnetic field are readily solved by an analog computer. The solutions produced by the computer represent the beam radius and slope as a function of axial distance for any desired variation of axially symmetric magnetic field. The equations of motion are derived and normalized so as to be easily translated into the machine variables of the analog computer. Relationships between the magnitude of a periodic magnetic focusing field and its spatial period are developed for electron beams with "minimum-ripple" boundaries.

General Mills, Inc., Minneapolis, Minn.
SPUTTERING YIELDS, by Gottfried K. Wehner. Final rept. for 1 May 57-30 Apr 58 on Contract Nonr-1589(08). 30 Apr 58, 45p. 14 refs. Rept. no. 1847.
Order from LC mi$3.30, ph$7.80 PB 138 569

Sputtering yield curves for normally incident Hg-ion bombardment in the energy region 50 to 400 ev have now been measured for the following materials: Graphite, Al, Si, Ti, V, Cr, Fe, Co, Ni, Cu, Ge, Zr, Cb, Mo, Rh, Pd, Ag, Hf, Ta, W. Re, Ir, Pt, Au, Th and U. Energy is most efficiently transferred in metals with completely filled d-shells like Cu, Ag and Au. These metals consequently show the highest sputtering yields.

Michigan U. Research Inst., Ann Arbor.
THE STUDY OF ELECTRON INTERACTION IN CROSSED-FIELD ELECTRON DEVICES, by B. Hershenov, R. J. Martin and others. Quarterly pro-

gress rept. no. 10, 15 June-15 Sep 58, on Contract DA 36-039-sc-56714. Sep 58, 25p. 3 refs. 2275-13-P
Order from LC mi$2.70, ph$4.80 PB 139 667

A technical report on the diocotron effect study has been issued and further experiments to be carried out are discussed. Improved uniformities of Poisson Cells have been obtained and a new pickup probe assembly has been designed. Solutions of the dispersion equation for a planar crossed-field device have been obtained and for an unconfined beam they agree well with the results of MacFarlane and Hay and Gould. Also, forward-wave solutions are presented for a crossed-field device with a slow-wave structure with the stream at various distances from the sole electrode. A plot of the VSWR for a coaxial-line match into an interdigital line and the effect of the presence of the sole plate on the ω-β diagram are discussed.

Minnesota U., St. Paul.
STUDY OF ELECTRICAL AND PHYSICAL CHARACTERISTICS OF SECONDARY EMITTING SURFACES, by W. G. Shepherd. Rept. for 1 Feb 56-15 Oct 57 on Electronic Component Sciences Research, Contract AF 33(616)3325. Aug 58, 100p. 41 refs. WADC Technical rept. 57-760; AD-155 852.
Order from LC mi$5.40, ph$15.30 PB 140 869

Procedures used in the preparation of MgO films on silver-magnesium alloy and on inert-metal bases. The stability of the secondary emission from MgO films subjected to electron bombardment and the effects of exposure to cesium vapor on the yield of these films have been studied.

Molecular Physics and Spectroscopy

Massachusetts Inst. of Tech., Cambridge.
PROPERTIES OF GASES AT EXTREMELY HIGH TEMPERATURES, by I. Amdur and E. A. Mason (University of Maryland). Technical rept. no. 3 on Contract Nonr-1841(23). 1 Aug 58, 50p. 37 refs.
Order from LC mi$3.30, ph$7.80 PB 140 896

Known intermolecular force laws are used to calculate virial coefficients of the equation of state and the transport properties at very high temperatures for the rare gases and for molecular nitrogen. The calculations cover the temperature range from 1000° to 15,000°K, but take into account only the translational degrees of freedom and neglect the effects of excitation, dissociation, and ionization. The methods which are used offer an approach to the problem of obtaining reasonably accurate estimates of gas properties at temperatures so high that direct experiments would be extremely difficult, if not impossible.

Norman Bridge Lab. of Physics, Calif. Inst. of Tech., Pasadena.
BETA-RAY SPECTROSCOPY, by Herbert E. Henrikson. Final rept. for 1 Apr 53-30 Apr 55 on Contract DA 04-495-ORD-444. [1955] 39p. 8 refs.
Order from LC mi$3.00, ph$6.30 PB 137 052

Rochester, U., N. Y.
EXCITED STATE WAVE FUNCTIONS, EXCITATION ENERGIES AND OSCILLATOR STRENGTHS FOR Ne($2p^5 3s$) by Albert Gold and Robert S. Knox. Rept. on Contract AF 49(638)432. Sep 58, 21p. 17 refs. AFOSR TN-58-885; AD-204 101.
Order from LC mi$2.70, ph$4.80 PB 137 156

Solutions of the Hartree-Fock equations for the ^3P and ^1P terms of neon ($ap^5 3s$) have been obtained. Wave functions are tabulated and results of computations of excitation energies and oscillator strengths are presented. The former fall within 10% of experimental values. It is found that enlarging the size of the "invariant core" used to compute the excited state wave functions has only a small effect on the predicted energies. The predicted oscillator strength of the 736A transition is 0.11, which is in reasonable agreement with available experimental data considering the large uncertainties in the measurements. The computed diamagnetic susceptibility of the ground state is -7.4×10^{-6} cm^{-3} mole, in good agreement with experiment.

Texas A. and M. Coll., College Station.
SPIN-LATTICE RELAXATION TIMES IN BINARY SOLUTIONS, by R. W. Mitchell and M. Eisner. Rept. on Contract AF 18(600)1300. Mar 59, 36p. 9 refs. AFOSR TN-59-286; AD-212 919.
Order from LC mi$3.00, ph$6.30 PB 140 813

Measurement of magnetic properties of solutions of organic solvents.

Optics

Battelle Memorial Inst., Columbus, Ohio.
DEVELOPMENT OF SPECIAL INFRARED TRANSMITTING GLASSES, by B. W. King and W. H. Duckworth. Quarterly engineering rept. no. 1 for 1 Apr-15 June 56 on Contract AF 33(616)3564. 10 July 56, declassified 25 June 58. 16p. 9 refs.
Order from LC mi$2.40, ph$3.30 PB 140 759

Vitreous-appearing Sb_2S_3 was prepared by melting the pure compound in argon followed by rapid quenching. The sample transmitted about 2 per cent of 1.5 to 15-micron radiation. Glasses were formed from melts in the high-Ta_2O_5 portion of the Al_2O_5-SiO_2-Ta_2O_5 system and the BaO-Al_2O_3-Ta_2O_5 system. Also, a glass was formed from melts in the PbO-Bi_2O_3-GeO_2 system. It transmitted well to about 6 microns. Transmission measurements in the range from 6 to 15 microns were made on crystalline powder compacts of Ta_2O_5, Nb_2O_5, Bi_2O_3, ZrO_2, or PbO and KBr.

Battelle Memorial Inst., Columbus, Ohio.
DEVELOPMENT OF SPECIAL INFRARED TRANSMITTING GLASSES, by B. W. King and W. H. Duckworth. Quarterly engineering rept. no. 2 for 16 June-15 Sep 56 on Contract AF 33(616)3564. 10 Oct 56, declassified 25 June 58. 56p. 11 refs.
Order from LC mi$3.60, ph$9.30 PB 140 758

Mixtures of Sb_2S_3 and K_2S, Na_2S, BaS, CaS, CdS, FeS, PbS, SnS, ZnS, Bi_2S_3, V_2S_3, MoS_2, BaO, CaO, PbO, As_2O_3, Bi_2O_3, Sb_2O_3, or V_2O_5 were melted, quenched, and examined for glass formation. The glass having the least tendency to devitrify contained 20 weight per cent of Sb_2O_3. It transmitted about 30 per cent in the range from 2 to 7 microns for sections about 2 mm thick. Ta_2O_5-containing compositions were explored. Glasses were observed in the system $PbO-Bi_2O_3-WO_3$, and in the system $BaO-Bi_2O_3-TiO_2$. (See also PB 140 759)

Bausch and Lomb Optical Co., Rochester, N. Y.
THICK THIN FILMS, by A. F. Turner and F. K. Truby. Yearly summary rept. no. 4, 20 Mar 50-20 Mar 51, on Contract DA 44-009-eng-18. 14 June 51, 34p. 1 ref. ATI-107 937.
Order from LC mi$3.00, ph$6.30 PB 140 975

The purpose of this investigation was to study the possibility of making optically satisfactory vacuum evaporated films up to a thickness of about 50 microns. Films of the required thickness were realized by alternately depositing dissimilar materials, controlled to give compensation of mechanical stresses. This report also discusses the possible reasons for encountering stresses in evaporated films. The most attractive hypothesis involves the polarizability and crystal structure of the filming material as well as the manner in which the crystallites grow in the evaporated films.

[Material Lab.] New York Naval Shipyard, Brooklyn.
SPECTACLES, INDUSTRIAL; AND LENSES, OPHTHALMIC, PLANO AND PRESCRIPTION, GLARE AND IMPACT RESISTANT; COMMENTS ON PROPOSED SPECIFICATION OF. Final rept. 13 June 58, 4p. Lab. Project 5663-20.
Order from LC mi$1.80, ph$1.80 PB 139 492

Office of Scientific Research and Development. Div. 16.
OPTICAL INSTRUMENTS. Summary technical rept. vol. 1, Contract OEMsr-1131. 1946, declassified 23 Nov 58, 641p. 188 refs.
Order from LC mi$11.10, ph$98.40 PB 139 784

Contents:
Chap. 1. Equipment for aerial photography
Chap. 2. Resolution in aerial photography
Chap. 3. Mapping methods employing high oblique photographs
Chap. 4. Optical testing methods
Chap. 5. Binoculars as aids to vision
Chap. 6. Harmonization of B-29 guns and sights
Chap. 7. Optical fluorite
Chap. 8. Optical plastics
Chap. 9. Optical techniques
Chap. 10. Optical systems for telescopes and binoculars
Chap. 11. Projecting systems and other special optical

Pennsylvania U., Philadelphia.
A NEW PHOTOMETRIC REFLECTANCE METHOD FOR THE DETERMINATION OF THE OPTICAL CONSTANTS OF CRYSTALS, by John R. Johnson. Technical rept. no. 15 on Contract N6onr-249(14). Aug 58, 141p. 57 refs.
Order from LC mi$7.20, ph$22.80 PB 140 886

A new photometric method for the determination of the real and imaginary parts of the complex index of refraction for both isotropic and anisotropic substances has been developed. The method consists of determining the angle of incidence at which one encounters the minimum reflectance for the parallel polarization, and the ratio of the reflectances for the parallel and perpendicular polarizations at that same angle of incidence.

Pomona Coll., Claremont, Calif.
HIGH RESOLUTION MICRORADIOGRAPHY, by Burton L. Henke. Technical rept. no. 2 on Ultrasoft X-Ray Physics, Contract AF 49(638)394. Sep 58, 72p. 8 refs. AFOSR TN-58-803; AD-202 236.
Order from LC mi$4.50, ph$12.30 PB 137 178

The requirement of ultrasoft x-radiation (10 to 100 A) for high resolution microradiographic analysis is established. Optimum methods are described for obtaining structure, mass distribution and mass-chemical information for microscopic sample regions as small as a few square microns and for total mass as small as a few micro-micrograms. The details of the techniques and of the instrumentation which are used in high resolution microradiographic analysis are presented.

Wayne State U., Detroit, Mich.
THEORETICAL INVESTIGATIONS ON THE LIGHT SCATTERING OF COLLOIDAL SPHERES. V. FORWARD SCATTERING, by Wilfried Heller, Masayuki Nakagaki, and Morton L. Wallach. Technical rept. no. 30 on Contract [Nonr]-736(00). 15 Aug 58, 23p. 7 refs.
Order from LC mi$2.70, ph$4.80 PB 140 904

The scattering of light, by non-absorbing colloidal spheres, in the direction of the primary beam (forward direction) is calculated by means of the Mie theory as a function of a and m. The parameters considered are: a = 1(1)15 for m = 1.05(0.05)1.30 and, in addition, a = 0.2(0.2)15.2 for m = 1.20. In addition to the i-values, the experimentally important quantity, I_{180}/I_{oc}, obtainable by Zimm plots, is evaluated. Its variation with particle size is compared to that of the total turbidity. The performance of the hitherto almost exclusively used Rayleigh-Gans-Debye equation is tested quantitatively against the exact Mie-data. The advantages of the "forward scattering method" for determining particle sizes are enumerated and a series of desirable definitions and clarifications of angular light scattering quantities are included. (See also PB 137 802)

Solid State Physics

Air Force Cambridge Research Center, Beford, Mass.
RADIOCHEMISTRY SECTION, COMPONENTS AND TECHNIQUES LABORATORY, by C. D. Turner.

Quarterly progress rept. nos. 3-4, 1 July-31 Dec 57, on Solid State Electronic Research. [1958] 42p. 14 refs. AFCRC TN-58-597; AD-208 158.
Order from LC mi$3.30, ph$7.80 PB 140 826

The report describes the work performed on the studies of a void-zone purification apparatus for purifying silicon tetraiodide and the decomposition of this material to silicon. Methods determining the diffusion coefficient of antimony in silicon are discussed; future plans for extension of these studies are given. In-house efforts and contractual work in the area of radiation effects to electronic material are mentioned. (See also PB 137 982)

Air Force Cambridge Research Center, Bedford, Mass.
SOLID STATE DIFFUSION, by I. Berman. Dec 58, 25p. 10 refs AFCRC-TN-58-596; AD-208 157.
Order from LC mi$2.70, ph$4.80 PB 140 824

A method for making junctions in silicon by solid state diffusion is presented which employs a fused silica tube extended through two controlled temperature zones. A carrier gas, such as helium or argon, is filled with an impurity from either Group III or Group V of the periodic chart of the elements. At elevated temperatures, a solid state diffusion occurs when the impurity elements contact the silicon surface. A technique for carrying out solid state diffusion of phosphorus and boron is specifically described.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
DIFFUSION OF COPPER INTO CADMIUM SULFIDE, by Francis A. St. Mary. Master's thesis. Mar 59, 43p. 15 refs. GNE-59-17.
Order from mi$3.30, ph$7.80 PB 140 732

Copper was diffused in cadmium sulfide single crystals to determine diffusion coefficients using the radioactive tracer sectioning technique.

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
OHMIC CONTACTS AND PRELIMINARY CONDUCTIVITY MEASUREMENTS ON CADMIUM SULFIDE WHISKERS, by Gerald Keith Hendricks. Master's thesis. Mar 59, 80p. 21 refs. GNE-59-9.
Order from LC mi$4.50, ph$12.30 PB 140 929

A method is developed for handling and putting electrical contacts on cadmium sulfide whisker crystals. Sputtered platinum contacts are found to have an ohmic response on cadmium sulfide whiskers. Preliminary electrical measurements indicate that the whisker photoconductivity is not that expected from a perfect crystal. The observed photoconductivity is apparently the result of impurities or the effect of surface states in the small diameter whiskers. The whisker dark current was too small to be measured with the equipment used in this study.

Airborne Instruments Lab., Inc., Mineola, N. Y.
USE OF SULFUR HEXAFLUORIDE AS A MICROWAVE DIELECTRIC MEDIUM, by F. Arams, M. Freundlich, and W. Peyser. Final rept. on Contract AF 30(635)2838. Oct 57, 44p. 19 refs. Rept. no. 3276-1; RADC TR-57-172; AD-131 334.
Order from LC mi$3.30, ph$7.80 PB 139 561

A study and investigation of sulfur hexafluoride was made to determine its usefulness as a microwave dielectric medium. It was found that the sulfur hexafluoride tanks contained impurities that were toxic. Toxicological tests on nontoxic SF_6 arced in waveguide indicate that the decomposition products of this gas are definitely hazardous.

Brandeis U., Waltham, Mass.
PARAMAGNETIC RELAXATION, by David L. Falkoff. Scientific rept. no. 1 on Theoretical Investigation of Relaxation Phenomena in Paramagnetic Materials, Contract AF 19(604)4107. Feb 59, 40p. 23 refs. AFCRC TN-59-139; AD-211 522.
Order from LC mi$3.00, ph$6.30 PB 140 825

A survey is given of some of the problems of paramagnetic relaxation at microwave frequencies and liquid Helium temperatures in the light of recent experiments of Townes. Strandberg and Bloembergen. It is shown that a more satisfactory theoretical basis for describing relaxation phenomena is gotten by describing the interacting phonon and spin systems in terms of the populations of excited states rather than thermodynamically, as the individual systems are generally not in equilibrium with themselves. The rate equations for transfer of energy between spins of any temperature (positive or negative) and monochromatic phonons are analyzed to show how they can be applied to distinguish between the "hot phonons" (Townes, Strandberg) and "spin-spin cross-saturation" (Bloembergen) theories. Applications to MASER operation are given.

Brown U., Providence, R. I.
RESEARCH DIRECTED TOWARD THE INVESTIGATION OF SILICON AND SILICON-CARBIDE SURFACES, by J. A. Dillon, Jr. and R. M. Oman. Scientific rept. no. 2, 1 Jan-31 Mar 59, on Contract AF 19(604)4568. Apr 59, 14p. 17 refs. AFCRC-TN-59-172; AD-214 411.
Order from LC mi$2.40, ph$3.30 PB 140 823

Silicon-carbide surfaces cleaned in ultra-high vacuum by argon-ion bombardment and 1000°C heating absorb oxygen at room temperature with a sticking coefficient of the order of 0.01. The adsorbed oxygen can be partially removed by heating in high vacuum at temperatures as low as 500°C. After prolonged argon-ion bombardment at current densities of about 1 ma/cm^2 and at an energy of 500 ev, etch patterns visible with an optical microscope appear on the surfaces of germanium and silicon.

Carnegie Inst. of Tech., Pittsburgh, Pa.
LATTICE SPECIFIC HEATS NEAR O DEGREES K WITH AN APPLICATION TO GERMANIUM, by Paul M. Marcus and Anthony J. Kennedy. Technical rept. no. 4 on Contract Nonr-760(05). Aug 58, 34p. 16 refs.
Order from LC mi$3.00, ph$6.30 PB 140 900

Formulas for the low temperature lattice specific heat are developed on the basis of the general adiabatic and harmonic assumptions, independently of special models or numerical procedures.

Cornell U., Ithaca, N. Y.
STUDIES ON THE MORPHOLOGY AND STRUCTURE OF COPPER FILMS DEPOSITED BY VACUUM EVAPORATION, by Benjamin M. Siegel. Technical rept. no. 9 on Theoretical and Experimental Investigations of the Atomic Phenomena Occurring on and Near the Surfaces of Solids, Contract AF 18(600)674. 15 Dec 58, 65p. 35 refs. AFOSR TN-59-7; AD-208 303.
Order from LC mi$3.90, ph$10.80 PB 139 654

A study has been made on thin copper films deposited by vacuum evaporation on mica at temperatures from room temperatures to above 400°C. These films, ranging in thickness from 50 to 1000A have been examined by transmission and replica electron microscopy, and by electron diffraction. The investigation has characterized the crystallite size and orientation. It has also been possible to demonstrate stacking faults in individual crystallites.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
INVESTIGATION OF THE SURFACE STATES ON N-TYPE GERMANIUM, by R. C. Sirrine. Technical rept. no. 1 on Contract Nonr-1834(17). Dec 57, 94p. 37 refs.
Order from LC mi$5.40, ph$15.30 PB 137 271

The study of semiconductor surface phenomena over the past few years has developed a surface model which postulates the existence of two types of surface states separated by a thin layer of oxide. The inner set of states, located at the interface between the oxide layer and the semiconductor, has time constants of the order of microseconds and is believed to be partially responsible for surface recombination phenomena. The outer set of states has time constants of the order of seconds and is greatly influenced by the nature of the ambient gas in contact with the surface. The research reported here is an attempt to clarify this model by combining sets of measurements designed to separate the influence of the two sets of states on the basis of their vastly different time constants.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
SURFACE PHENOMENA IN SOLIDS: A LITERATURE REVIEW, by Cecil G. C. White and Samuel Helf. May 59, 34p. 119 refs. Technical rept. 2566; AD-208 231.
Order from OTS $1.00 PB 151 846

This report describes the results of a literature survey on some of the fundamental principles and experimental practices involved in the study of adsorption phenomena on solids. One section consists of an elementary review of the theories of adsorption on solids and another is a description and discussion of the classical methods for the determination of surface area of solids. A third section is devoted to a special bibliography on previous applications of radioactive isotopes to the study of surface phenomena.

Gordon McKay Lab., Harvard U., Cambridge, Mass.
THERMAL AND MAGNETIC PROPERTIES OF PRASEODYMIUM ETHYLSULPHATE BELOW 1°K, by Horst Meyer. Scientific rept. no. 17 on Contract AF 19(604)1084. 5 May 58, 16p. 20 refs. AFCRC TN-58-160; AD-160 814.
Order from LC mi$2.40, ph$3.30 PB 137 250

Single crystals of praseodymium ethylsulphate have been cooled below 1°K by adiabatic demagnetization and the susceptibility, expressed in terms of the magnetic temperature T, was measured as a function of T using cerium magnesium nitrate as a thermometer. The specific heat was measured by electrical heating of the sample. A systematic departure of the susceptibility from Curie's law and an anomaly in the specific heat was found. The results were interpreted and confirmed the existence of a variable splitting of the ground doublet, as predicted from paramagnetic resonance experiments, with a root-mean-square value of $\Delta_0 = (0.53 \pm 0.04)$°K, which is much larger than the one in the diluted salt.

Hebrew U. (Israel).
ELECTRON SPIN RESONANCE IN SINGLE CRYSTALS OF $BaTiO_3$, by W. Low and D. Shaltiel (Israel Inst. of Tech.) Technical note no. 1 on Contract AF 61(052)59. May 58, 11p. AFOSR TN-58-544; AD-158 361.
Order from LC mi$2.40, ph$3.30 PB 136 995

Hebrew U. (Israel)
PARAMAGNETIC RESONANCE OF S STATE IONS IN STRONTIUM CHLORIDE, by W. Low and U. Rosenberger. Technical note no. 6 on Contract AF 61(052)59. [1959] 14p. 11 refs. AFOSR TN-59-416; AD-214 563.
Order from LC mi$2.40, ph$3.30 PB 140 803

Paramagnetic resonance spectra have been observed of Mn^{2+}, Gd^{3+} and Eu^{2+} in single crystals of strontium chloride grown from the melt. The Mn^{2+} shows a very small cubic field splitting $a < 1 \times 10^{-4}$ cm^{-1} and a hyperfine structure constant of $A = 81.2 \times 10^{-4}$ cm^{-1}, indicating some covalent bonding. The Gd^{3+} and Eu^{2+} have cubic symmetry with splitting parameters. The smaller cubic field splittings in $SrCl_2$ compared with CaF_2 seem to favour a mechanism responsible for the cubic field splitting which is linear in the crystal potential terms.

Illinois U., Urbana.
AN ELECTROLYTIC SAW, by M. Metzger. Rept. on Contract N6ori-071(58). 20 Mar 58 [8]p. 7 refs.
Order from OTS $0.50 PB 151 574

The electrolytic saw leaves a strain-free surface. In comparison with the chemical saw, the advantages of the electrolytic method are its greater speed and the fact that it does not require the use of strong acids which produce corrosive or irritating vapors and which may tend to charge the specimen with hydrogen. Its principal disadvantage lies in the difficulty of obtaining a smooth sharp cut.

Institute for the Study of Metals, U. of Chicago, Ill.
ON THE DYNAMICAL THEORY OF DIFFUSION IN CRYSTALS. II. PRESSURE DEPENDENCE OF THE SELF DIFFUSION CONSTANT, by Stuart A. Rice and Norman H. Nachtrieb. Mar 59, 24p. 15 refs.
AFOSR[TN]-59-93; AD-210 183.
Order from LC mi$2.70, ph$4.80 PB 139 555

It is shown that in the limit of low pressures there exists a law of corresponding states and that the temperature and pressure derivatives of the self diffusion coefficient are related. Application of the theory is made to Na and Pb. For Pb, the computed heat of activation is 23,300 cal to be compared with the experimental value of 23,210 cal.

Istituto Elettrotecnico Nazionale "Galileo Ferraris" (Italy).
FURTHER EXPERIMENTS ON MODULATION OF CONDUCTIVITY BY SURFACE CHARGES IN METALS, by Guido Bonfiglioli and Renato Malvano. Technical note no. 1a on Study of the Surface Electrical Conduction in Metals, Contract AF 61(514)1333. 1958, 13p. 5 refs. AFOSR TN-58-746; AD-201 512.
Order from LC mi$2.40, ph$3.30 PB 136 871

The investigation of the phenomenon as function of temperature evidences, the existence of trapping states, at the metal/dielectric interface, with a trap depth of the order of 0.1 ./. 0.2 eV.

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
OXYGEN IMPURITY IN SILICON SINGLE CRYSTALS, by A. Smakula and J. Kalnajs. Rept. on Contract Nonr-1841(10). Nov 57, 14p. 25 refs. Technical rept. 122.
Order from LC mi$2.40, ph$3.30 PB 137 134

Comparison of the lattice constant and density of "pure" silicon crystals and oxygen-contaminated crystals favors the substitutional position of oxygen in the silicon lattice rather than the interstitial. Infrared absorption bands for pure silicon crystals coincide with the absorption bands of quartz. Pure silicon crystals show a higher absorption tail above 1.2 μ, indicating strong strains.

Liége U. (Belgium).
RESEARCH ON NUCLEAR QUADRUPOLE RESONANCE IN SOLIDS, by J. Duchesne. Final technical rept. on Contract AF 61(514)1212. [1958] 71p. 49 refs. AFOSR TR-59-24; AD-211 608.
Order from LC mi$4.50, ph$12.30 PB 139 563

Contents:
Detection of pure quadrupole spectra
Nature of chemical bonds
Resonance intensity in mixed crystals
Research in radiation chemistry
Tentative interpretation of radiation resistance
Post effects and oxygen effect
Neutron - irradiated sodium chlorate
Study of the broadening effect of resonance lines

Louvain U. (Belgium).
STUDIES ON THE MECHANISM OF ELECTROLUMINESCENCE, by A. Luyckx, J. Vandewauwer and others. Final technical rept. for 15 Nov 56-14 Nov 58 on Contract AF 61(514)1118. [1958] 58p. 5 refs.
AFOSR TR-59-12; AD-210 472.
Order from LC mi$3.60, ph$9.30 PB 139 585

Digests coverage to date in the form of listings and reports and papers previously submitted on the subject and then covers new material involving variable frequency and electroluminescent powders as semiconductors. Electronic and ionic current studies were involved.

Material Lab., New York Naval Shipyard, Brooklyn.
RESEARCH AND DEVELOPMENT PROGRAM ON ULTRA-HIGH TEMPERATURE DIELECTRICS: TECHNICAL WORK PLANS. 21 Jan 59, 13p.
Order from LC mi$2.40, ph$3.30 PB 139 520

Outline of properties to be investigated and of tentative procedures which will be followed for magnet wire, embedding compounds, capacitor dielectrics, and liquid dielectrics.

Miami U., Coral Gables, Fla.
FOURIER COEFFICIENTS OF CRYSTAL POTENTIALS, by Joseph Callaway and M. L. Glasser. Technical rept. no. 9 on Contract Nonr-840(06). May 58, 13p. 7 refs.
Order from LC mi$2.40, ph$3.30 PB 139 486

Fourier coefficients of the electrostatic potential of a given distribution of valence electrons in a solid. The valence electron wave functions are expressed as combinations of orthogonalized plane waves. Application is made to lithium.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
HIGH POWER MEASURING TECHNIQUES, by Paul G. Mariotti. Quarterly rept. no. 2, 1 Oct-31 Dec 57, on Contract AF 30(602)1686. 26 Mar 58, 21p. 3 refs. Rept. R-642.2-57; PIB-552.2; RADC-TN-58-139; AD-148 737.
Order from LC mi$2.70, ph$4.80 PB 137 005

The errors of two different devices for sampling the power along a mismatched transmission line have been analyzed. One device consists of a uniform continuous distribution of probes which are responsive to the square of the rf voltage along the line, the other of an array of equally spaced probes of similar characteristics but whose outputs bear some arbitrary ratio to each other. Minimization of the error of the latter array over a two to one frequency band by use of Tschebyscheff polynomials yields the spacing and output ratios of the probes. The resultant error is found to be significantly less than that of a continuous type sampling device of the same physical length. The load was assumed to have a reflection coefficient unrestricted in phase but limited in amplitude over the band. The use of the Hall effect for sampling power in a line is discussed and different materials compared as to effectiveness.

Mineralogical Lab., U. of Michigan, Ann Arbor.
SOME OPTICAL AND STRESS-OPTICAL PROPERTIES OF SYNTHETIC RUBY, by Joseph Anthony Mandarino. Rept. on Contract N6onr-232(09). 25 Aug 57, 120p. 38 refs.
Order from LC mi$6.00, ph$18.30 PB 137 135

Absorption and biabsorption in pink and red synthetic ruby and piezobirefringence and piezobiabsorption in pink synthetic ruby subjected to a stress parallel to the c-axis. The main absorption peak (due to chromium) in substances of relatively low optical anisotropy and absorption is independent of the internal structure of the substance. In synthetic corundum the biabsorption peak occurs at approximately the same point at which the chromium absorption peak occurs. With increasing stress, biabsorption was found to increase throughout the spectral region and to shift towards the longer wave lengths.

Minnesota U., Minneapolis.
TWINNING STUDIES OF QUARTZ TYPE STRUCTURES, by John W. Gruner and Lynn Gardiner. Quarterly progress rept. no. 1, 1 Dec 50-28 Feb 51, on Contract DA 36-039-sc-5419. 1 Apr 51, 13p.
Order from LC mi$2.40, ph$3.30 PB 140 799

Contents:
Experimental quartz growth under controlled pressure
Discussion of comparable experiments

Minnesota U., Minneapolis.
TWINNING STUDIES OF QUARTZ TYPE STRUCTURES, by John W. Gruner and Lynn Gardiner. Quarterly progress rept. no. 5, 15 Ma5-15 June 52, on Contract DA 36-039-sc-5419. [1952] 15p.
Order from LC mi$2.40, ph$3.30 PB 140 808

Fourteen new experiments are described. Portions of seed crystals extending above the solutions appear to grow by creep. A crystal exposed only to the gas phase was corroded, decreasing in weight significantly. Complete filling of bombs with solution with elimination of the gas phase makes no apparent difference in twinning tendency in the new growth on the seeds. Twinning in the seed crystal appears to roughly coincide with growth of spontaneous quartz on the bomb walls. It seems to be related to the degree of supersaturation of the solutions. Baffles which impede the convection of the solutions evidently increase the growth rate significantly without eliminating twinning. (See also PB 140 768)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
ELECTRONIC PROPERTIES OF SEMI-CONDUCTOR MATERIALS, by J. Maczuk, R. M. Showers, and B. P. Fabricand. Final rept. for 1 Mar 57-30 June 58, on Study of Lifetime and Injection Ratio Characteristics of Minority Carriers on Silicon Single Crystals, Contract DA 36-039-sc-72406. 30 June 58, 32p. 18 refs. Moore School rept. no. 58-22.
Order from LC mi$3.00, ph$6.30 PB 137 070

The lifetime of minority carriers injected either from point contacts or large area zinc contacts in p-type silicon increases with increase of temperature above room temperature. At room temperature the lifetime of minority carriers injected from point contacts is larger than it is in the case of injection from large area zinc electrodes and the injection ratio is larger by a factor of 10.

Motorola, Inc., Phoenix, Ariz.
INDUSTRIAL PREPAREDNESS STUDY ON DIFFUSED SEMICONDUCTOR DEVICES 5 AND 9. Quarterly rept. no. 1, 5 July-31 Oct 57, on Contract DA 36-039-sc-72694. 20 Oct 57, 17p.
Order from LC mi$2.40, ph$3.00 PB 137 162

Techniques for fabricating germanium devices to meet the requirements per SD project 509-77 (PROP) for Devices 5 and 9 have been developed. This Report describes the latest modifications which have been made in these techniques and an evaluation of the results.

Motorola, Inc., Phoenix, Ariz.
INDUSTRIAL PREPAREDNESS STUDY ON DIFFUSED SEMICONDUCTOR DEVICES 5 AND 9. Quarterly rept. no. 2, 1 Nov 57-5 Jan 58, on Contract DA 36-039-sc-72694. 5 Mar 58, 26p.
Order from LC mi$2.70, ph$4.80 PB 137 163

This report includes summary of the design considerations, a description of the manufacturing techniques being developed for production, and a statistical evaluation of state-of-the-art samples. Revised target specifications on these devices are also given. (See also PB 137 162)

National Bureau of Standards, Washington, D. C.
DETWINNING QUARTZ CRYSTALS, by F. P. Phelps. Apr 59, 7p. Technical note no 3, formerly NBS rept. 3326.
Order from OTS $0.50 PB 151 362

Attempts were made to detwin quartz by cooling through the inversion temperature while a d. c. potential was applied and later with RF potential across the plate. BT, AT and X cut plates were used. Air was largely removed to improve the insulation but this was not wholly satisfactory because of the difficulty of adequately degassing the sample. Some samples yielded untwinned plates, others did not. It appeared that different samples of quartz behaved differently in respect to ease of changing the twin pattern. The method used did not appear commercially useful because of the erratic behavior of different pieces of quartz.

Oregon State Coll., Corvallis.
A MAGNETIC STUDY OF COLOR CENTERS IN ALKALI HALIDES, by Allen B. Scott. Technical rept. no. 1 on Contract Nonr-1286(05). 15 Aug 58, 9p. 15 refs.
Order from LC mi$1.80, ph$1.80 PB 140 897

The purpose of the present work is to provide new information concerning the behavior of electrons trapped in the field of trivalent cation impurities in alkali

halides and thus to extend our knowledge of electronic processes in ionic crystals.

Oregon U., Eugene.
SEMI-CONDUCTING PROPERTIES OF INTERMETALLIC COMPOUNDS, by R. T. Ellickson. Quarterly progress rept. no. 1, 16 Mar-15 June 56, on Contract DA 36-039-sc-70139. [1956] 10p.
Order from LC mi$1.80, ph$1.80 PB 137 263

Samples of $AgSbS_2$, $AgInS_2$, $CuInS_2$, and $AgInSe_2$. Samples of the first four compounds now being prepared are not of good enough quality to justify an extensive study of their electrical properties.

Oregon U., Eugene.
SEMI-CONDUCTING PROPERTIES OF INTERMETALLIC COMPOUNDS, by R. T. Ellickson. Quarterly progress rept. no. 2, 16 June-15 Sep 56, on Contract DA 36-039-sc-70139. [1956] 14p.
Order from LC mi$2.40, ph$3.30 PB 137 264

Samples of $AgInS_2$, $AgInSe_2$, $AgGaS_2$, $CuInS_2$, and $CuGaS_2$, and $CuSbS_2$ (except $CuSbS_2$) are difficult to prepare. When the elements react to form the compounds, they often do so violently with explosions. The resulting samples are porous and are not suitable for electrical or optical measurement. Good ingots of $CuSbS_2$ have been prepared. (See also PB 137 263)

Oregon U., Eugene.
SEMI-CONDUCTING PROPERTIES OF INTERMETALLIC COMPOUNDS, by R. T. Ellickson. Quarterly progress rept. no. 3, 16 Sep 56-15 Jan 57, on Contract DA 36-039-sc-70139. [1957] 9p.
Order from LC mi$1.80, ph$1.80 PB 137 265

Examination of samples of $CuSbS_2$ which seem to show large grain size, by back-reflection x-ray photographs shows that they are polycrystalline. Attempts to pull single crystals from the melt have been unsuccessful. (See also PB 137 264)

Oregon U., Eugene.
SEMI-CONDUCTING PROPERTIES OF INTERMETALLIC COMPOUNDS, by R. T. Ellickson. Quarterly progress rept. no. 4, 15 Dec 56-15 Mar 57, on Contract DA-36-039-sc-70139. [1957] 8p. AD-132 935.
Order from LC mi$1.80, ph$1.80 PB 137 266

$CuSbS_2$ samples purified by zone-refining, although very brittle, are nonporous, and x-ray diffraction photographs indicate a single compound. (See also PB 137 265)

Oregon U., Eugene.
SEMI-CONDUCTING PROPERTIES OF INTERMETALLIC COMPOUNDS, by R. T. Ellickson. Quarterly progress rept. no. 5, 16 Mar-15 June 57, on Contract DA 36-039-sc-70139. [1957] 11p. AD-142 990.
Order from LC mi$2.40, ph$3.30 PB 137 267

Sample compounds of $CuSbS_2$, $AgSbS_2$, and $CuFeS_2$ were prepared by the reaction of the elements in a Vycor tube. Most samples were too porous. The $CuSbS_2$ and $CuFeS_2$ compounds were too brittle; the $AgSbS_2$ showed practically no rectifying characteristics. One $CuFeS_2$ sample passed a 3.5-ma current when the W probe was -3.5 v and passed a 0.2-ma current when the probe was 3.5 v, which indicates that the material is p-type. Heating the S first with continuous pumping gets rid of considerable volatile material, probably occluded gases. Several X-ray diffraction photographs indicate that the reaction is complete in all compounds. (See also PB 137 266)

Oregon U., Eugene.
SEMI-CONDUCTING PROPERTIES OF INTERMETALLIC COMPOUNDS, by R. T. Ellickson. Quarterly progress rept. no. 6, 16 June-15 Sep 57, on Contract DA 36-039-sc-70139. [1957] 9p. 2 refs.
Order from LC mi$1.80, ph$1.80 PB 137 268

A search of the literature for other methods for the preparation of compounds, better methods for the purification of the starting materials, and construction of apparatus for preparation of the compounds. Construction of an apparatus should make it possible to pull single crystals from the melt. (See also PB 137 267)

Oregon U., Eugene.
SEMI-CONDUCTING PROPERTIES OF INTERMETALLIC COMPOUNDS, by R. T. Ellickson. Quarterly progress rept. no. 7, 16 Sep-15 Dec 57, on Contract DA 36-039-sc-70139. [1957] 10p. 1 ref.
Order from LC mi$1.80, ph$1.80 PB 137 269

We have designed two methods for drawing samples from the melt, one involving a liquid seal and one involving a ground glass joint for rotation of the pulling apparatus. (See also PB 137 268)

Oregon U., Eugene.
SEMI-CONDUCTING PROPERTIES OF INTERMETALLIC COMPOUNDS, by R. T. Ellickson. Final rept. for 16 Mar-15 Mar 58 on Contract DA 36-039-sc-70139. [1958] 12p.
Order from LC mi$2.40, ph$3.30 PB 137 270

Samples of seven compounds namely $AgInS_2$, $AgInSe_2$, $AgGaS_2$, $CuInS_2$, $CuGaS_2$, $CuSbS_2$, $AgSbS_2$ were not of good enough quality to justify extensive measurements of their electrical or optical properties. Difficulties in their preparation appear to outweigh any advantages they may have in the way of a wide range of characteristics. (See also PB 137 269)

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
CRYSTAL CHEMISTRY STUDIES, by E. Aleshin, A. Gentile and others. Quarterly progress rept. no. 1 1 Oct-31 Dec 57, on Contract DA 36-039-sc-74957. 15 Jan 58, 12p. 6 refs.
Order from LC mi$2.40, ph$3.30 PB 137 144

Contents:
Silica studies

The system Y_2O_3-Al_2O_3
The system Gd_2O_3-Fe_2O_3
Solid solution in the garnet structure
Neutron-damage studies

Philco Corp., Philadelphia, Pa.
RESEARCH DIRECTED TOWARD THE GROWTH OF SILICON CRYSTALS FROM SILANE, by T. J. Carroll, R. F. Lever, and J. K. Powers. Final rept. for 1 Apr 58-31 Mar 59 on Contract AF 19(604)4066. 15 May 59, 26p. 31 refs. AFCRC TR-59-155; AD-216 523.
Order from OTS $0.75 PB 151 841

The silane was decomposed in the temperature range from 900°C to the melting point of silicon, 1420°C, and at silane pressures from somewhat less than 1/2 mm to about 20 mm Hg, with and without a diluent gas (H_2). When the substrate temperature was much below 1200°C or if extensive gas-phase decomposition occurred, the deposit was in the form of a grayish microcrystalline accretion. In the absence of gas-phase decomposition, pinnacles were frequently observed to be oriented with respect to the substrate. Oriented overgrowth, has been observed up to depths of 1 mm. Exploratory work was undertaken on the silicon-iodine system at 1000 to 1100°C. Small crystals with linear dimensions of the order of 1 mm were obtained in the form of clearly defined polyhedra.

Polytechnic Inst. of Brooklyn, N. Y.
COMPOUNDS WITH DEFECT LATTICES, by E. Banks, L. Fankuchen and others. Progress rept. no. 1, 15 Nov 57-15 Feb 58 on Contract DA 36-039-sc-74958. [1958] 19p. 9 refs.
Order from LC mi$2.40, ph$3.30 PB 137 071

Contents:
Ta_2O_5-WO_3 solid solutions
Preparation of binary selenides
Ternary selenide preparation
Structure investigation
Single crystal growth
Ternary telurides

Polytechnic Inst. of Brooklyn, N. Y.
COMPOUNDS WITH DEFECT LATTICES, by E. Banks, B. Noval, and I. Lieblich. Progress rept. no. 2, 16 Feb-15 May 58, on Contract DA 36-039-sc-74958. [1958] 16p. 3 refs.
Order from LC mi$2.40, ph$3.30 PB 137 072

Sequence of phases in the $Ta2O5$-WO_3 system. A new magnetic phase has been found in an attempted preparation of Fe Se2. In the series $Cu_xFe_{3-x}Se_3$ the most strongly magnetic seems to be $Cu_{0.8}Fe2.2Se_3$. (See also PB 137 071)

Polytechnic Inst. of Brooklyn, N. Y.
PHOTOCONDUCTION IN SINGLE CRYSTALS OF ZnS, by J. J. Dropkin and F. G. Ullman. Final rept. for 1 Dec 53-31 Aug 58 on Contract AF 18(600)692. [1958] 111p. 52 refs. AFOSR TR-58-126; AD-203 331.
Order from LC mi$6.00, ph$18.30 PB 140 850

Synthetic single crystals of ZnS were grown by deposition of ZnS vapor obtained by sublimation of unactivated ZnS powder in an atmosphere of flowing helium. A two zone furnace was constructed for this purpose. The ac and dc photoconduction in non-luminescent natural and synthetic single crystals of ZnS (with small amounts of impurities) has been investigated. The spectral response of photoconduction in the synthetic crystals has been investigated from 0.5 to 2.0 micron.

Purdue U., Lafayette, Ind.
REFLECTANCE SPECTRA OF PRASEODYMIUM OXIDES IN THE RANGE Pr_2O_3 TO Pr_6O_{11}, by F. Vratny, M. Tsai, and J. M. Honig. Rept. on Contract AF 18(603)45. Mar 58, 11p. 11 refs. AFOSR TN-59-404; AD-214 524.
Order from LC mi$2.40, ph$3.30 PB 140 805

The spectra of praseodymium oxides (PrO_x) has been studied in the composition range $1.5 \leq X \leq 1.83$ from 200 to 2000 mμ. An ultraviolet cut-off was observed at about 320 mμ, exciton interaction was observed in the spectral range of 400-650 mμ, and a band observed in the near infrared which begins at about 900 mμ. The spectra are discussed in terms of known changes in the crystalline structure of the material.

Raytheon Mfg. Co., Waltham, Mass.
RESEARCH STUDIES AND INVESTIGATIONS OF THE SOLID STATE CHEMISTRY OF FERRITES, by A. E. Paladino, Jr. Quarterly progress rept. no. 2, 15 Apr-15 July 58, on Contract DA 36-039-sc-74987. 20p. 6 refs.
Order from LC mi$2.40, ph$4.80 PB 137 195

Phase equilibria in the system Fe-Ni-O have been investigated in the vicinity of $NiFe_2O_4$ up to a temperature of 1300°C. The stability of spinel solid solutions up to 1300°C in oxygen pressures of from one atmosphere to 10^{-2} atmospheres has been determined. Resistivity measurements have been made on $NiFe_2O_4$-Fe_3O_4 solid solutions.

Virginia U., Charlottesville.
CORRELATION OF ANNIHILATION RADIATION IN ORIENTED SINGLE METAL CRYSTALS, by Stephan Berko and John S. Plaskett. Rept. on Contract Nonr-474(07). [1958] 42p. 21 refs.
Order from LC mi$3.30, ph$7.80 PB 140 828

Precision measurements of photon annihilation in crystals of Al and Cu show relatively small variation with crystal orientation.

Washken Labs., Cambridge, Mass.
INVESTIGATION OF NEPHELINE AND RELATED SUBSTANCES WITH PARTICULAR EMPHASIS ON GROWING CRYSTALS FOR PIEZOELECTRIC MEASUREMENTS, by Edward Washken. Rept. no. 3 (Final) 1 Mar-31 Oct 49, on Contract W36-039-sc-38217. [1949] 34p. 1 ref.
Order from LC mi$3.00, ph$6.30 PB 137 077

Parallel growth of nepheline was found upon a seed which had been in contact with the melt for twenty-four hours at a furnace temperature of about 1000°C. The original 86.4% $NaAlSiO_4$-13.6% LiF composition was optimum for the growth of nepheline in this system. The nepheline structure can be obtained from a melt of composition $KNa_3Al_4Si_4O_{16}$ without the use of a flux. (See also PB 137 076)

Washken Labs., Cambridge, Mass.
INVESTIGATION OF NEPHELINE AND RELATED SUBSTANCES WITH PARTICULAR EMPHASIS ON GROWING CRYSTALS FOR PIEZOELECTRIC MEASUREMENTS, by Edward Washken. Rept. no. 19 (Final) 1 July 46-28 Feb 49, on Contract W36-039-sc-32333. 31 Mar 49, 54p. 3 refs.
Order from LC mi$3.60, ph$9.30 PB 137 076

Nepheline has been crystallized from melts containing silicic acid, alumina and sodium carbonate to the composition $NaAlSiO_4$, plus a flux of lithium fluoride. The best growth could be obtained by using fourteen percent by weight of lithium fluoride. Crystallization at a constant temperature in the neighborhood of the eutectic, 915°C, produced the largest and clearest crystals. Two interesting crystalline phases of lithium aluminum silicate have been found in the lithium fluoride-bearing melts used to grow nepheline.

Theoretical Physics

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
TRANSMISSION OF AN ELECTROMAGNETIC WAVE THROUGH A HYPERSONIC SHOCK WAVE, by Donald Preston Rhude. Master's thesis. Mar 59, 72p. 11 refs. GE-59A-9.
Order from LC mi$4.50, ph$12.30 PB 140 943

Hypersonic vehicles traversing the earth's atmosphere create a highly ionized shock region of heated and compressed air. The classical solution for electromagnetic ionospheric propagation may be best adapted to propagation through shock regions by introducing a complex dielectric constant. Shock region propagation may be considered the cumulative effect of cascaded homogeneous dielectric walls. The resultant equation may be solved by a digital computer if shock region temperature and density distribution are available. Calculations indicate that transmission is possible with less than 3 db loss if the incident frequency is greater than 20% of the maximum plasma resonant frequency.

Brandeis U., Waltham, Mass.
STATISTICAL THEORY OF ELECTRONIC ENERGIES, by Sidney Golden. Technical rept. no. 5 on Contract Nonr-1677(01). 1 Aug 58, 26p. 28 refs.
Order from LC mi$2.70, ph$4.80 PB 140 966

It would appear that the statistical theory of electronic energies, introduced originally as the Thomas-Fermi theory, is capable of approaching in accuracy the results of quantum mechanics.

California Inst. of Tech., Pasadena.
ION EXCHANGE KINETICS. A NONLINEAR DIFFUSION PROBLEM. II, by M. S. Plesset, F. Helfferich, and J. N. Franklin. Rept. on Contract Nonr-220(28). June 58, 21p. 3 refs. Engineering Div. rept. no. 85-9.
Order from LC mi$2.70, ph$4.80 PB 139 651

The differential equation derived previously which describes the particle diffusion controlled ion exchange between spherical beads of uniform size and a well-stirred solution is solved numerically for the exchange of monovalent ions for bivalent ions, and of bivalent ions for monovalent ions. The approach is based on the Nernst-Planck equations of ionic motion. Numerical results for six different mobility ratios are presented and discussed. (See also PB 136 439)

Illinois U., Urbana.
BROWNIAN MOTION ON A GREEN SPACE, by J. L. Doob. 31 Oct 57, 32p. 6 refs. AFOSR TN-56-573; AD-110 395.
Order from LC mi$3.00, ph$6.30 PB 137 297

Reprint from Teoriya Veroyatnostey i Yeye Primeneniya (USSR) 1957, v. 2, no. 1, p. 3-33.

The purpose is to extend the basic results of Brownian motion theory, as already developed for spaces which are subsets of Euclidean N-space, to Green spaces. These spaces are the natural ones for Brownian motion. A significant advantage in going from Euclidean spaces to Green spaces is that, in much of the discussion, the character of the boundary does not enter.

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
INTENSITY AND DAMPING DEPENDENCE OF VARIOUS PARAMETERS DESCRIBING SPECTRAL-LINE SHAPES, by R. D. Waldron. Rept. on Contract Nonr-1841(10). Sep 58, 28p. 7 refs. Technical rept. 128.
Order from LC mi$2.70, ph$4.80 PB 140 934

Analytical expressions are presented for the frequency dependence of loss factor, conductivity, loss tangent, amplitude attenuation per radian (absorption index), imaginary refractive index, amplitude and power attenuation per unit length (absorption coefficient), and reflectivity for a damped harmonic oscillator system. Equations are given for the displacement of maxima of these parameters as a function of line strength and width (intensity and damping). Some limiting value relations are given, and the functional dependences of the parameters illustrated graphically. Applications to physical problems are discussed briefly.

Materials Research Lab., Watertown Arsenal, Mass.
X-RAY INOCHERENT SCATTERING FUNCTIONS FOR NON-SPHERICAL CHARGE DISTRIBUTIONS: N, N^-, O^-, O, O^+, O^{+2}, O^{+3}, F, F^-, Si^{+4}, Si^{+3}, Si AND Ge, by A. J. Freeman. Rept. on Contract DA 5-93-32-001. Jan 59, 28p. 22 refs. MRL rept. no. 61, AD-210 838.
Order from LC mi$2.70, ph$4.80 PB 139 659

The atomic incoherent scattering functions of N, N^-, O^-, O, O^+, O^{+2}, O^{+3}, F, F^-, Si^{+4}, Si^{+3}, and Ge have been calculated according to the Waller-Hartree theory as extended in a previous paper to include the effects of the inherent non-sphericity of the atomic charge distributions. Hartree-Fock wave functions were used in all the computations. The results obtained show large deviations from the previously reported values of James & Brindley. These differences arise mainly from the inclusion in the present calculations of all the exchange integrals in the Waller-Hartree expression.

Naval Research Lab., Washington, D. C.
DAMPING THEORY, by R. C. O'Rourke. Interim rept. 13 May 59, 18p. 4 refs. NRL rept. 5315.
Order from LC mi$2.40, ph$3.30 PB 139 726

A time-dependent formulation of Heitler's damping theory which includes the Wigner-Weisskopf theory is presented. No results are obtained which are not implicit in the work of these authors but it is felt that the use of Laplace transform techniques is more direct than the Fourier integral techniques of Heitler. Also the case of mixed states is formulated whereas only pure states are usually discussed in the conventional treatments. This type of work is being applied to various line-broadening problems in high-temperature physics.

Stanford U., Calif.
CALCULATIONS IN SCHRÖDINGER PERTURBATION THEORY, by C. Schwartz. Technical rept. no. 39 on Contract AF 18(600)545. Sep 58, 25p. 9 refs. Stanford rept. no. 545-39; AFOSR TN-58-831; AD-202 916.
Order from LC mi$2.70, ph$4.80 PB 137 111

The evaluation of second- and higher-order perturbations of the energy by iterative solution of Schrödinger's equation, rather than by evaluation of the well-known matrix formulae, is described and exploited. Several examples are worked out exactly for the hydrogen atom, to point the way for other more practical, but more involved, problems.

Stanford U., Calif.
NEW CALCULATION OF THE NUMERICAL VALUE OF THE LAMB SHIFT, by C. Schwartz and J. J. Tiemann. Technical rept. no. 41 on Contract AF 18(600)545. Sep 58, 17p. 5 refs. Stanford rept. no. 545-41; AFOSR TN-58-833; AD-202 918.
Order from LC mi$2.40, ph$3.30 PB 137 109

The calculation of the second-order perturbation in hydrogen which gives the low-energy part of the Lamb Shift is attacked from a new approach, described in the preceeding papers and here extended. A formula is gotten for $\ln(k_0)$ involving a double integral. The final numerical evaluation using an electronic computer to sum the series expansion of this formula yields what we believe to be the most accurate value of $\ln(k_0)$ yet given. Small discrepancies with the earlier results of Harriman are outside the realm of current physical significance, but do indicate that the reliability of the earlier results was badly overestimated. Approximate formulas for the radiative-perturbed wave functions are given; these may be quite useful for further calculations.

Stanford U., Calif.
ON THE USE OF APPROXIMATE WAVE FUNCTIONS, by C. Schwartz. Technical rept. no. 40 on Contract AF 18(600)545. Sep 58, 15p. 9 refs. Stanford rept. no. 545-40; AFOSR TN-58-832; AD-202 917.
Order from LC mi$2.40, ph$3.30 PB 137 110

A procedure is given for using approximate wave functions (derived, say, by the Ritz variational method), to calculate properties of the system other than the energy to an accuracy much greater than that previously thought to be possible. The method is based on the form of perturbation theory discussed in the previous paper but stands by itself as an independent and, it is believed, very powerful innovation. Several sample problems, based on the two-electron atom, are worked out; and a program of greatly increasing the accuracy in the calculation of many properties of atomic systems is envisaged.

University Coll., Cork (Eire)
RESEARCH ON TORSION AND PLATE PROBLEMS, by Patrick M. Quinlan. Annual summary rept. no. 1, 1 Dec 56-30 Nov 58, on Contract AF 61(514)1163. 6 Jan 59, 8p. 7 refs. AFOSR TN-59-297; AD-213 081.
Order from LC mi$1.80, ph$1.80 PB 140 814

Abstract of 7 papers dealing with elastic analysis of plates and beams.

Thermodynamics

AeroChem Research Labs., Inc., Princeton, N. J.
REACTION RATE DISTRIBUTIONS ON CATALYTIC SURFACES, by D. E. Rosner. Rept. on Contract AF 49(638)300. 26 Dec 58, 8p. 4 refs. AeroChem TM-12; AFOSR TN-59-432; AD-214 794.
Order from LC mi$1.80, ph$1.80 PB 140 809

Ambrok's [Soviet Phys JETP. 2:1979-1986, 1957] nonsimilarity correction to the Nusselt number is applied to the diffusion boundary layer with catalytic surface reaction. For the laminar boundary layer on a catalytic flat plate closed form results are obtained for the steady state reactant concentration along the surface and hence the reaction rate distribution, for arbitrary values of the reaction order.

California U., Berkeley.
KINETICS OF GAS-PHASE NUCLEATION, by Chester T. O'Konski. Final rept. on Contract Nonr-222(12). 1 Jan 58, 137p. 138 refs.
Order from OTS $2.75 PB 151 532

The Becker-Doering theory of nucleation kinetics and some of its limitations are briefly reviewed. Attempts were made to study the nucleation of some of the alkali halides. Some special problems that were encountered are pointed out and discussed. Intensive consideration was given to the possibility of develop-

ing experimental methods more suitable for studies of gas-phase nucleation, and in particular for tests of the theory, than the usual cloud-chamber techniques. A steady-state flow method was selected and developed. An analysis was made for the rate of nucleation as a function of the supersaturation, temperature, and coordinates in the jet. It was found that tests of the nucleation theory were possible. Experiments were carried out for a series of compounds characterized by different types of molecular interactions.

Carnegie Inst. of Tech., Pittsburgh, Pa.
THE ATOMIC HEAT OF DIAMOND FROM 11° TO 200°K (I); CALORIMETER RESPONSE (II); PRESSURE REGULATORS (III). by D. L. Burk and S. A. Friedberg. Technical rept. no. 2 on Contract Nonr-760(05). Aug 58, 62p. 25 refs.
Order from LC mi$3.90, ph$10.80 PB 140 879

The atomic heat has been measured in a vacuum calorimeter. The observations are consistent with a $\theta_{D(O)} = 2240° \pm 5°K$ calculated from the elastic constants.

David Taylor Model Basin, Washington, D. C.
SOLUTION OF HEAT BALANCES ON A DIGITAL COMPUTER, by Paul Mulé (Bureau of Ships) and James R. Paul. Jan 59, 51p. 2 refs. Rept. 1264.
Order from LC mi$3.60, ph$9.30 PB 139 600

The objective of this problem was to describe a heat-balance calculation and to program it for the UNIVAC high-speed computer. The problem consisted of two parts: a steam-flow balance, and a heat balance around the de-aerating feed tank.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THERMODYNAMICS OF A FULLY IONIZED GAS IN A STRONG MAGNETIC FIELD, by Rudolph C. Hwa. Scientific rept. no. 5 on Contract AF 19(604)2152. 25 Sep 58, 16p. 14 refs. AFCRC TN-58-581; AD-206 579.
Order from LC mi$2.40, ph$3.30 PB 139 558

Thermodynamic properties of a fully ionozed gas in a strong magnetic field are investigated. An entropy balance equation is derived from the statistical point of view. If heating by shock wave and cooling by Bremsstrahlung radiation are neglected, the plasma behaves quasi-statically in a strong magnetic field. The thermodynamic process that it undergoes is adiabatic and reversible. The mechanism that keeps the plasma quasi-static is the rapid gyro-motion of the particles around the magnetic field lines, while the thermodynamic reversibility is due to the absence of randomization processes.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
LOW-FIELD MOBILITIES OF THE NEGATIVE IONS IN OXYGEN, SULFUR HEXAFLUORIDE, SULFUR-DIOXIDE, AND HYDROGEN CHLORIDE, by E. W. McDaniel and R. C. McDowell. Technical rept. no. 2 on Contract AF 18(600)1524. 15 Nov 58, 37p. 48 refs. AFOSR TN-58-909; AD-204 513.
Order from LC mi$3.00, ph$6.30 PB 140 811

Measurements of the low-field mobility of the negative ions in O_2, SF_6, SO_2, and HCl are described. The results are 2.46, 0.57, 0.35, and 0.71 cm^2/v-sec, respectively, reduced to 0° C and 760 mm Hg pressure. A quantum mechanical theory of ionic mobility is outlined and applied to the gases investigated experimentally. Comparison of the experimental and theoretical results indicates that the oxygen ion is O_3^-, but attempts to identify the ions in the other gases are inconclusive.

Institute of Engineering Research, U. of California, Berkeley.
PRELIMINARY DESIGN AND TESTS OF PLASMA JET, by W. Lai, D. H. Sloan, and L. Talbot. Technical rept. on Contract Nonr-222(45). 15 Nov 57, 18p. 9 refs. Rept. no. HE-150-153; Series no. 20, issue no. 115.
Order from LC mi$2.40, ph$3.30 PB 137 090

Massachusetts Inst. of Tech., Cambridge.
APPLICATION OF WELL-STIRRED REACTOR THEORY TO THE PREDICTION OF COMBUSTOR PERFORMANCE, by Allan Hardy Bonnell. Doctoral thesis. Technical rept. on Project Squid, Contract N6ori-105(03). May 58, 252p. 30 refs. MIT-18-T.
Order from LC mi$11.10, ph$39.60 PB 140 919

In the work reported here conceptual models of high-output systems are considered in which the combustion chamber is visualized as consisting only of a small number of interacting elements composed of homogeneous reaction volumes. Pressure interaction and recirculation are considered. Performance curves developed for four typical models show qualitatively flow interactions and residual flame phenomena typically observed in real combustion chambers. Predicted performance characteristics based on the above models were compared with experimental data obtained in a small combustion chamber burning premixed propane-air mixtures. Stability limits, combustion efficiency-loading rate data, and visual observation of flame and flow were typical measurements made on chamber performance.

Massachusetts Inst. of Tech., Cambridge.
ON THE CALCULATION OF PROPERTIES OF GASES AT ELEVATED TEMPERATURES, by I. Amdur and J. Ross (Brown U.). Technical rept. no. 2 on Contract Nonr-1841(23). 1 Aug 58, 18p. 9 refs.
Order from LC mi$2.40, ph$3.30 PB 140 965

The role of the potential of intermolecular force in determining properties of gases at elevated temperatures is discussed.

Massachusetts Inst. of Tech., Cambridge.
A RADIOMETER FOR MEASUREMENT OF HIGH INTENSITY RADIANT FLUX, by T. Y. Toong. June 59, 10p. 2 refs. AFMDC TN-59-17; AD-216 109.
Order from OTS $0.50 PB 151 842

A circular-foil radiometer which can be used to measure continuously the instantaneous and local value of high-intensity radiant flux incident upon its small receiving area, is described and its performance computed.

Wave Propagation

Antenna Lab., Ohio State U. Research Foundation, Columbus.
DIFFRACTION BY RIBS OF LARGE GROUND RADOMES. Interim engineering rept. for 1 Feb-30 Apr 57 on Contract AF 30(602)1620. 31 May 57, 30p. 8 refs. Rept. 722-2; RADC TN-57-240; AD-131 148.
Order from LC mi$2.40, ph$4.80 PB 137 291

Analytical and experimental techniques were developed for analyzing the antenna pattern distortion caused by either dielectric or metal structures. The measurements were made with a conventional antenna pattern range comprising a 10,000-mc klystron power source, antenna mount, and logarithmic recorder. Two types of arrangements were made with respect to relative motion of antenna and diffracting structure. With one, the receiver and scatterer are rotated together, maintaining the orientation between them as the azimuth (far-field) angle is varied. In the other, the scattering structure is mounted in a stationary manner such that the orientation between the antenna and the structure changes as the azimuth angle is varied. The theory which was developed for the diffraction of an electromagnetic wave by a plane dielectric lattice permitted calculations of the scattered, but not the total far-field pattern. An approximate theory for the amplitude of the scattering from an array of parallel metal rods was experimentally confirmed. An analytical method is being developed for approximating the induced currents on small metal objects in the radome structure.

Brown U. Div. of Engineering, Providence, R. I.
TRANSMISSION OF WAVES THROUGH IONIZED LAYERS, by E. T. Kornhauser. Scientific rept. AF 4561/2 on Study of Radiation of Electromagnetic Waves, Contract AF 19(604)4561. Feb 59, 17p. 8 refs. AFCRC TN-59-136; AD-211 150.
Order from LC mi$2.40, ph$3.30 PB 140 827

An electromagnetic wave incident upon the boundary of an ionized medium in the presence of a transverse magnetic field will excite, in addition to the reflected and transmitted electromagnetic waves, a reflected sound wave and a transmitted modified sound wave. It is shown that the power coupled into these acoustic waves is proportional to the magnetohydrodynamic coupling parameter and to the ratio of sound velocity to light velocity. Electromagnetic transmission through a thin ionized layer may take place by means of this modified sound wave even though the layer thickness is large compared to the electromagnetic skin depth, although the efficiency of transmission will be very low for weak magnetohydrodynamic coupling.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
INFLUENCE OF METEOR RADIANT DISTRIBUTIONS ON RADIO-ECHO RATES, by Jesse C. James. Doctorale thesis. Technical rept. no. 3 on Contract Nonr-991(02). 20 May 58, 117p. 20 refs.
Order from LC mi$6.00, ph$18.30 PB 140 815

Meteor-trail communication is being increasingly studied because there is an ever increasing demand for additional channels of radio communication. This research was concerned with certain aspects of the usefulness of these meteor trails as reflectors. Specifically, a study has been made to determine how the number of meteor signals received per unit of time varies with the time of day and the month of the year over an arbitrary meteor trail communication link. An additional result has been the development of a basis for predicting the relative number of useable meteor trails in various regions of the sky.

Göttingen U. (West Germany).
ABSORPTION AND TRANSMISSION OF ELECTROMAGNETIC WAVES. PHASE E. ABSORPTION OF MICRO-WAVES BY MULTIPLE RESONANCE ABSORBERS, by H. J. Schmitt. Final technical rept. on Contract AF 61(514)876. 31 July 56, 35p. RADC TR-56-170; AD-97 965.
Order from LC mi$3.00, ph$6.30 PB 137 160

The simple dipole resonance absorber described in the last Technical Report is further investigated with respect to a reduction of its layer thickness and an enlargement of its effective band width. The total layer thickness of the absorber can be reduced by an increase of the dielectric constant of the layer between the dipole grating and the metal wall. With increasing value of the dielectric constant, however, a reduction of the effective band width occurs at the same time.

Metals Research Lab., Brown U., Providence, R. I.
MULTIPLE SCATTERING OF WAVES, by Peter C. Waterman and Rohn Truell. Technical rept. on Contracts DA 19-020-505-ORD-(3882, 3650). Oct 57, 77p. 12 refs. WAL 143/14-49.
Order from LC mi$4.50, ph$12.30 PB 137 174

Governing equations are obtained for the problem of multiple scattering of waves in a homogeneous isotropic medium containing a statistical array of scattering regions. The equations are applicable to sound waves in solids, liquids and gases, electromagnetic waves, and stationary quantum-mechanical problems. From these equations the macroscopic properties of the "scattering medium" may be obtained in terms of the scattering properties of a single scatterer. Questions of energy and measurement are discussed, and several examples are considered. An extension of the theory to the elastic problem with mode conversion is included.

Microwave Physics Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
INVESTIGATION OF SUBMILLIMETER WAVE GENERATION, by E. N. Skomal. Scientific rept. no. 1, 1 June-31 Aug 58, on Contract AF 19(604)4081. 28 Aug 58, 10p. 3 refs. MPL-C7; AFCRC-TN-58-

380; AD-160 829.
Order from LC mi$1.80, ph$1.80 PB 137 247

It has been demonstrated that the harmonics of a microwave frequency ω generated in a magnetized ferrite attain maximum amplitude at a magnetic field equal to that required for optimum sum frequency mixing of the frequency ω and a harmonic of ω. Experimentally, it has been demonstrated that the 3rd harmonic of frequency ω arising from harmonic generation can be increased in amplitude by the addition of the sum frequency signal generated by mixing, in the same ferrite, the second harmonic 2ω and the fundamental ω.

Pennsylvania State U., University Park.
TRANSIENT ANALYSIS OF STRESS-WAVE PENETRATION IN PLATES, by Norman Davids. Interim technical rept. no. 15 on Scabbing and Fracture of Materials by Stress Waves, Contract DA 36-061-ORD-465. 1 Sep 58, 46p. 15 refs.
Order from LC mi$3.30, ph$7.80 PB 136 757

This paper carries out an analysis of the propagation of a transient stress pulse concentrated at a point on the boundary of a plate whose thickness is of the order of a wavelength. It is based on an expansion method used by Caigrand in geophysical layer problems which obviates the contour integration difficulties and whose terms represent successively - reflected waves of increasing time delay. From the general formulae obtained in this paper for an arbitrary forcing function, the stress vs. time distribution along the axis of a 1" thick aluminum plate is obtained for a 5 microsecond exponential pulse.

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

Armed Services Technical Information Agency, Arlington, Va.
CORPORATE AUTHOR HEADINGS. [July 57] reprinted Nov 58, 352p.
Order from OTS $5.00 PB 151 856

Microwave Lab., Stanford U., Calif.
NOTE ON UNIQUE DECIPHERABILITY, by E. T. Jaynes. Rept. on Contract AF 49(638)342. Jan 59, 14p. 4 refs. ML rept. no. 567; AFOSR TN-59-52; AD-209 423.
Order from LC mi$2.40, ph$3.30 PB 139 633

We consider an alphabet of a letters, used under the restrictions: (1) messages uniquely decipherable into words, and (2) words limited to a maximum length of L letters. Defining "semi-optimal" transmission by the condition that the mean transmission time per word is minimized for a given entropy per word, we find the attainable rate of information transmission under semi-optimal conditions. Transmission at full channel capacity is a special case of semi-optimal transmission. The constraint of unique decipherability causes no decrease in capacity of the alphabet, considered as a channel, unless accompanied by other constraints. Accordingly, in the absence of other constraints an inequality of McMillan pertaining to uniquely decipherable messages is actually an equality. Some generalizations and analogies to statistical mechanics are discussed.

Zator Co., Cambridge, Mass.
THE NEXT TWENTY YEARS IN INFORMATION RETRIEVAL: SOME GOALS AND PREDICTIONS, by Calvin N. Mooers. Rept. on Contract AF 49(638)376. Mar 59, 21p. 17 refs. ZTB-121; AFOSR TN-59-245; AD-212 225.
Order from LC mi$2.70, ph$4.80 PB 140 835

Some of the history of retrieval machine development during the past 20 years is sketched as background. Future developments are sketched. It is shown how this process, when combined with work on mechanical translation, will lead to machines which can provide essays on any given subject upon request. Machines will become archival devices to store facts, not texts. Information machines can be expected to become as numerous as computers now are.

MISCELLANEOUS

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS. Aug 59.
Order from OTS $1.25, $10.00/year PB 151 341

Contents:
Articles:
Project ORCON: The use of pigeons to guide missiles.
Differential cross sections for the $Be^9(He^3, p)B^{11}$ reaction, by E. A. Wolicki, H. D. Holmgren and others.
Scientific Program:
Astronomy and Astrophysics: Relation between cm-wavelength bursts and solar H-α flares. Polarization of 10-cm radiation from the Crab Nebula and other sources. Thermal radiation from the planets Mars and Jupiter. Atmospheric transmission of visible light. Air concentration of gross fission product radioactivity during the IGY (July 1957-December 1958). Profiles of temperature and frost point temperature obtained from balloon-borne meteorological instruments
Chemistry: Surface activity of fluorinated organic compounds at organic-liquid/air interfaces: surface tension vs concentration curves, adsorption isotherms, and force-area isotherms for partially fluorinated carboxylic esters. Marine borer control: a toxicity screening test for candidate marine wood preservatives. Corrosion of wrought iron in tropical environments. Reactions of organosphosphorus acids with isocyanates: base-catalyzed condensation and condensations in the absence of bases. The vaporator: a device for measuring the vapor source strength of cw-contaminated surfaces

Mathematics: Proved theorem applicable to the modern technique of printed circuits. Several versions of the Gaussian elimination method adopted for high-speed computation and programmed for NRL's digital computer (NAREC)

Mechanics: Relative thermoelectric power of indium binary alloys with tin and lead substitutions at $0^{o}C$

Metallurgy and Ceramics: Exploratory titanium alloy research. Charpy-V transition temperatures of ferritic iron alloys (Fe-Cr and Fe-Cr-Al). Relationship between thermal ordering and irradiation-induced ordering in magnetic materials. Neutron flux surveys of various research reactors used in studying the radiation damage of materials. Solidification of the aluminum-silicon eutectic

Nuclear and Atomic Physics: Spin-state neutron resonances in In^{115}. Energy production and fusion products from a thermonuclear plasma. Radiation-scanning device to observe meltdown and subsequent behavior of molten fuel of a fast breeder reactor

Radio: Symbolic address-symbolic optimum programs for a drum-memory computer. Secondary emission ratios of storage tube insulators

Solid-State Physics: Theory of the valence band structure of germanium in magnetic fields. Dipolar fields and normal modes in magnetic garnet. Locale of Peltier effects in thermoelectric junctions

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General

Completion report. Project Chariot-Phase I. Operation PLOWSHARE. Holmes & Narver, Inc. Engineers Constructors, Los Angeles, Calif. 1958. Contract AT-(29-2)-20. 69p. Order from OTS. $1.50. AECU-4039

An instrument-tower design for a nuclear test, by W. J. Francy. Sandia Corp. Albuquerque, N. Mex. Dec 1954. Contract AT(29-1)-789. 23p. Order from LC. Mi $2.70, ph $4.80. SCTM-268-54(51)

Deep underground test shots, by David Griggs and Edward Teller. Univ. of California. Radiation Lab., Livermore Site, Livermore, Calif. Feb 1956. Decl. Jan 1959 and Feb 1959. Contract W-7405-eng-48. 8p. Order from OTS. 50 cents. UCRL-4659

Peaceful uses of fusion, by Edward Teller. Univ. of California. Radiation Lab., Livermore, Calif. Jul 1958. Contract W-7405-eng-48. 11p. Order from CTS. 50 cents. UCRL-5257 Rev.

Evaluation of the ground water contamination hazard from underground nuclear explosion, by Gary H. Higgins. Univ. of California. Lawrence Radiation Lab., Livermore, Calif. Apr 1959. Contract W-7405-eng-48. 25p. Order from OTS. 75 cents. UCRL-5538

Biology and Medicine

Fundamentals of aging. Insolubilization of protein as a function of aging. Quarterly report no. 3 for October 1, 1958-December 31, 1958, by Johan Bjorksten and others. Bjorksten Research Foundation. Madison, Wis. 1958. Contract AT(11-1)-606. 10p. Order from LC. Mi $1.80, ph $1.80. AECU-3965

The effects of X-irradiation upon embryonic development in the Paradise fish, Macropodus Opercularis, with some notes on normal stages, by A. Lester Allen. Brigham Young, Univ. Provo, Utah. 1958. Contract AT(11-1)-349. 37p. Order from LC. Mi $3.00, ph $6.30. AECU-3967

Effect of ionizing radiation on electrolyte and water metabolism. Final report for the period July 1, 1950 to October 31, 1958. Univ. of Minnesota. Medical School, Minneapolis, Minn. 1958. Contract AT(11-1)-106. 119p. Order from LC. Mi $6.00, ph $18.30. AECU-3983

Chemical methods for routine bioassay, by John B. Hursh. Univ. of Rochester. Rochester, N. Y. Nov 1958. 109p. Order from OTS. $1.00. AECU-4024

Semiannual report to the Atomic Energy Commission, by Leon O. Jacobson, M.D. and Antreen Pfau. Argonne Cancer Research Hospital. Chicago, Ill. Mar 1959. Contract AT-(11-1)-69. 103p. Order from OTS. $2.50. ACRH-11

The photochemical apparatus—its structure and function. Report of symposium held June 16-18, 1958. Brookhaven National Lab. Biology Dept., Upton, N. Y. 1958. 374p. Order from OTS. $3.50. BNL-512 (C-28)

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